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INDEXES OF UNITED STATES STOCK PRICES FROM 1802 TO 1987

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ABSTRACT

Monthly stock returns from Smith and Cole [1935], Macaulay [1938] and Cowles [1939] are compared and contrasted with the returns to the CRSP value and equal-weighted portfolios of New York Stock Exchange (NYSE) stocks. Daily stock returns from Dow Jones [1972] and Standard & Poor's [1986] are compared and contrasted with the returns to the CRSP value and equal-weighted portfolios of NYSE and American Stock Exchange (AMEX) stocks. Effects of dividends, nonsynchronous trading and time-averaging are analyzed. Splicing together the best indexes gives monthly data from 1802-1987 (2,227) observations) and daily data from 1885-1987 (28,884 observations.)

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1. Introduction

It is widely recognized that the development of the monthly New York Stock Exchange (NYSE) stock return database by the Center for Research in Security Prices (CRSP) at the University of Chicago spawned an explosion of empirical research in finance during the late 1960's and early 1970's. Papers such as Fama, Fisher, Jensen and Roll [1969], Blume [1971], Black, Jensen and Scholes [1972], and Fama and MacBeth [1973] have accumulated several hundred citations each from subsequent papers in economics journals. As noted by Merton [1987], one of the unfortunate byproducts of this public good is that researchers have focused most of their attention on these data because of the relatively inexpensive high quality data provided by CRSP. The CRSP database starts in 1926, just years before the Great Depression, which is the most severe economic contraction in United States' history. There is evidence that the behavior of stock market volatility and stock returns was unusual in the 1929-1939 decade, so empirical tests that include these data are suspect. For example, Schwert [1988] argues that the standard deviation of monthly stock market returns rose more during the Depression than can be explained by the increase in the volatility of other economic variables. Kim, Nelson and Startz [1988] and Poterba and Summers [1988] show that the mean reversion of stock returns discussed by Fama and French [1988a] is heavily influenced by the 1929-1939 data.

Because of the recent interest in long-run behavior of stock returns, and the realization that the Great Depression may be unusual,[1] there has been a renewed interest in the behavior of pre-

[1]It is worth noting that macroeconomists have devoted much effort to studying the unusual behavior of economic aggregates during the Great Depression. It is arguable that the creation and popularity of Keynesian economics was largely due to these empirical anomalies.

CRSP stock return data. For example, Wilson and Jones [1987] use a slightly corrected version of the Cowles [1939] stock market return series to replicate the Ibbotson and Sinquefield [1976] study of stock, bond and bill returns and inflation for 1871-1925. Schwert [1988, 1989a] and Pagan and Schwert [1989] study monthly volatility of stock return data from Smith and Cole [1935], Macaulay [1938] and Cowles [1939]. Schwert [1989b] studies the behavior of daily stock returns and volatility from February 1885 through 1987 using the Dow Jones' portfolios from 1885-1927 and the Standard & Poor's composite portfolio from 1928-1987.

This paper compares and contrasts all of the major indexes of stock prices or returns that are available monthly or daily from 1802-1925. In some cases these series overlap the CRSP data, so there is an opportunity to evaluate the limitations of the alternative series. The outcome of this comparison is a series of stock portfolio returns from 1802-1925 that come closest to the CRSP value-weighted portfolio of NYSE stocks.

Section 2 contains a brief description of early stock price or return indexes, including a description of the measurement process for individual stock prices, the method of weighting used to create the index, and the treatment of dividend payments. Section 3 performs descriptive statistical analysis of the various portfolio returns, with emphasis on a comparison of alternative portfolios when they overlap. Perhaps, the broadest portfolios of pre-1925 stocks, and the only one that includes dividends, is the series by Cowles [1939]. Unfortunately, the Cowles data use the averages of high and low prices in the month for individual stocks. This form of time aggregation has effects similar to the analysis of Working [1960]. To document the effects of this measurement process, section 4 analyzes a Cowles-type portfolio created from the CRSP database of daily stock prices and returns for all NYSE and American Stock Exchange (AMEX) stocks. Section 5 compares the daily stock price indexes available from Dow Jones [1972] for the 1885-1939 with the Standard & Poor's index from 1928-1987 and the CRSP index from 1962-1987. Section 6 contains summary statistics for the best spliced portfolio of monthly stock returns from 1802-1925 and the best spliced portfolio of daily stock returns from 1885-1987. Section 7 contains brief conclusions. The appendix at the end of the paper lists the spliced monthly stock price index number (a listing of the daily series is available from the author.)

2. Early Stock Price Indexes

2.1 The Smith and Cole Indexes of Bank, Insurance and Railroad Stock Prices

Smith and Cole [1935] summarized much of the early work on stock price indexes by the Harvard Economic Society (see Persons *etal.* [1920], Matthews [1926], and Cole and Frickey [1928].) They created several indexes for various periods from 1802-1860. From 1802 through 1820 (Table 61, p. 173), they construct an equal-weighted portfolio of seven bank stocks in Boston(3), New York(2) and Philadelphia(2). The price quotations came from local newspapers, and they often were averages of bid and ask prices, rather than transactions prices. From 1815 through 1845 (Table 62, p. 174), they created an equal-weighted portfolio of six New York banks and one insurance stock. For both of these portfolios, Smith and Cole omitted most of the stocks for which they had collected price data. They chose stocks in hindsight to represent typical movements in the period. The sample selection bias caused by only including stocks that survived and were actively quoted for the whole period is obvious.

From 1834 through 1845 (Table 69, p. 183) and 1843 through 1862 (Table 70, p. 184), Smith and Cole constructed an equal-weighted portfolio of all railroad stocks for which a rate of return could be calculated. At most 27 stocks are in the portfolio, and they are split between New England and the Central Atlantic regions. In the period of overlap, these indexes differ only by rounding error.

It is unclear at what time in the month Smith and Cole collected stock prices, but they did use point-sampled prices rather than time-averaged prices (i.e., they used one price per month per stock, instead of an average of several prices in the month.) This is important in analyzing the autocorrelation of monthly returns or the volatility of returns.

Smith and Cole used equal-weighted portfolios of stock prices. They did not measure dividend payments. Thus, the portfolio return R_{pt} for N stocks is

$$R_{pt} = \sum_{i=1}^{N} w_i R_{it}, \qquad w_i = 1/N \tag{1}$$

$$R_{it} = (p_{it} / p_{it-1}) - 1, \tag{2}$$

where p_{it} is the price of stock i in month t.

2.2 The Macaulay Index of Railroad Stock Prices

Macaulay [1938] created an index of railroad stock prices from January 1857 through December 1938. His rationale for focusing on railroad stocks was that railroads were essentially the only non-financial stocks actively traded from 1857 through 1909 (Macaulay [1938, pp. 138-139]), and he wanted to maintain a comparable portfolio throughout his sample. It is unclear what sources Macaulay used to collect individual stock prices, but he included all railroads with actively traded stocks. The number of stocks in the index varied from about 25 to about 50, being lowest in the early part of the sample. Most of the railroads were in the Northeast and mid-Atlantic regions.

It is not clear when during the month Macaulay measured prices. He used a value-weighted portfolio of stocks to create his index number, and he did not measure dividend payments. Thus, the portfolio return R_{pt} for N stocks is

$$R_{pt} = \sum_{i=1}^{N} w_{it} R_{it}, \qquad w_{it} = (p_{it-1}\, q_{it-1}) \,/\, (\sum_{i=1}^{N} p_{it-1}\, q_{it-1}), \tag{3}$$

where individual stock returns are measured as in (2), and q_{it-1} is the number of shares outstanding at the beginning of the month.

2.3 The Cowles Index of NYSE Stock Prices and Dividends

Cowles [1939] was the largest effort to collect 19th century stock return data. His aggregate index included all NYSE-listed stocks whose prices were reported in the *Commercial and Financial Chronicle* during a month. In addition, Cowles is the only researcher to measure dividend payments so a total rate of return can be measured. As shown below, this is most important for judging the level of average returns to stocks. It is much less important for judging the autocorrelation or volatility of stock returns. In addition to his aggregate index, Cowles created 68 industry indexes.

The Cowles data cover the January 1871-December 1938 period. From 1918-1938, Cowles used the Standard & Poor's industrial portfolios. He used Macaulay's index for his railroad industry portfolio.

Cowles used a value-weighted portfolio of individual stocks to create his index number. He created both price and total return indexes. Thus, the portfolio return including dividends for N stocks uses (3) and returns are calculated as

$$R_{it} = [(p_{it} + d_{it})/p_{it-1})]-1, \tag{4}$$

where d_{it} is the dividend payment per share to stock i in month t. The number of industrial stocks in the Cowles index varied from 12 (in 1871) to 351 (in 1938.)

As mentioned in the introduction, the biggest problem with the Cowles data, relative to the CRSP value-weighted portfolio, is that the price for an individual stock was measure as the average of the high and low prices in the month, rather than the last trade (closing price) in the month. This problem occurred because the primary data source was the *Commercial and Financial Chronicle*, which only reported high and low prices. For the data after 1918, a similar problem exits, since the monthly Standard & Poor's indexes are averages of the weekly values in the month. Section 4 documents the effects of using such time-averaged data.

2.4 The Dow Jones Indexes of NYSE Stock Prices

Beginning February 16, 1885 to the present, Dow Jones [1972] has reported daily indexes of from 12 to 50 industrial and transportation stock prices. The composition of the index has changed many times, but the goal has been to include the stocks that were most important to stock traders in trading activity or market capitalization. The index numbers are price-weighted and they do not include dividends, so portfolio returns are calculated using

$$R_{pt} = \sum_{i=1}^{N} w_{it} R_{it}, \qquad w_{it} = (p_{it-1} / \sum_{i=1}^{N} p_{it-1}) \tag{5}$$

and returns are calculated using (2). From 1885-1896, Dow Jones calculated one index that was dominated by railroad stocks, but included a few industrials. From 1897-present, they report separate indexes for transportation and industrial stocks. I combine these indexes to create a composite index weighting each subindex in proportion to the number of stocks in each portfolio

(e.g., 60 percent weight on the 30 industrials and 40 percent weight on the 20 transportation stocks since October 1928.)

2.5 The Standard & Poor's (S&P) Composite Index

From January 1928 through February 1957, Standard & Poor's [1986] reported a daily value-weighted index of 90 prominent NYSE common stocks. In March 1957, the coverage of the index expanded to 500 stocks. These indexes do not include dividends, so portfolio returns are measured using (3) and (2).

The monthly S&P composite index that is frequently published in government statistics sources is *not* the S&P composite index for the last day of the month. Instead, it is an average of the daily index values in the month. Thus, the time-aggregation problem mentioned above is a problem for this monthly S&P series.

3. Statistical Comparison of Alternative Indexes

3.1 Sample Moments and Autocorrelations of Returns

Table 1 contains the sample mean *(Mean)*, standard deviation *(Std Dev)*, skewness *(Skew)*, excess kurtosis *(Kurt)*, studentized range *(SR)*[2] and 12 autocorrelations for the monthly returns to various indexes over the entire span of each index. It also contains the Box-Pierce [1970] statistic for the joint significance of the 12 autocorrelations *(Q(12))*. It is difficult to compare the various indexes when the sample periods differ. Nevertheless, several patterns emerge from table 1.

First, the earliest indexes of bank and insurance company stock returns, Smith and Cole [1935, Table 61] (SC(61)) and Smith and Cole [1935, Table 62] (SC(62)), are much less volatile than the later series. The standard deviations for these two returns series are less than half as large as the next lowest series.[3]

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[2]David, Hartley and Pearson [1954] describe the use of the range divided by the standard deviation as a test for non-normality or heteroskedasticity.

[3]An F-test for the equality of variances would be greater than 4, which is highly significant.

Second, as mentioned before, the main effect of dividends on the index returns is to increase mean returns. Comparing the Cowles series and the CRSP value and equal- weighted portfolios of NYSE stocks with and without dividends, the only statistic that differs is the average return, which increases by about .004 (0.4 percent per month.) Accordingly, including dividends increases the t-statistic for the mean return. Dividend yields of about 5 percent per year are a substantial fraction of the average return, but they vary so little through time it is almost like a constant is added to the capital gain returns.

Third, as noted by many analysts, the returns are not normally distributed. All of the skewness coefficients are reliably different from 0, and most are positive (exceptions are three of the Smith and Cole series SC(61), SC(62) and SC(70).) All of the kurtosis coefficients are reliably larger than 0, and the studentized range statistics are large relative to their sampling distribution. These results could be due to a fat-tailed distribution of returns or to non-constant variability of returns (heteroskedasticity.) Schwert [1988, 1989a, 1989b] and others show that heteroskedasticity is an important factor for these stock return series.

Finally, all of the index returns are positively autocorrelated at lag 1. Part of this effect could be due to nonsynchronous trading of the individual stocks in the index (Fisher [1966].) This is likely to be more serious in the earlier data, where price quotes are not readily available every day for every stock. As discussed before, the Cowles series is measured using the average of high and low prices for individual stocks in the month. As predicted by Working [1960], and the analysis in section 4 below, this causes autocorrelation at lag 1 close to .25. Although it is not clear how Macaulay [1938] obtained his stock prices, the large autocorrelation at lag 1 (.40) strongly suggests that he also used some form of time-averaged data.

3.2 Comparison of Indexes When They Overlap

The largest difficulty in drawing conclusions from the data in table 1 is that the sample periods are so different. Table 2 contains sample moments, studentized ranges, three autocorrelations and cross-correlations for 3 leads and lags for all pairs of returns series for periods of overlap. Many of these subsamples are small, but they provide the only direct basis for comparing different portfolio returns series.

Smith and Cole [1935, Table 61] Bank Stocks (SC(61)) vs. Smith and Cole [1935, Table 62] Bank and Insurance Stocks (SC(62)), 1815-1820

These two series of bank stock returns are similar, although they are only correlated .54 in the current month. Even though these stocks are in the same industry, there is no overlap across these portfolios.

Smith and Cole [1935, Table 62] Bank and Insurance Stocks (SC(62)) vs. Smith and Cole [1935, Table 69] Railroad Stocks (SC(69)), 1834-1845

As mentioned in table 1, the bank stock series SC(62) has much less volatility than the railroad series SC(69) -- the standard deviation is almost twice as high for SC(69). Both series are positively autocorrelated at lag 1. They are correlated .52 in the current month, with cross-correlations of .19 and .23 at a one month lead and lag. This is consistent with prices for individual stocks in both indexes that are measured at different times in the month.

Smith and Cole [1935, Table 70] Railroad Stocks (SC(70)) vs. Macaulay [1938, Table 10] Railroad Stocks, 1857-1862

This comparison provides some of the best clues about the measurement techniques used by different researchers. The Macaulay returns have a much lower standard deviation (.0509 vs. 0731) and larger first order autocorrelation (.26 vs. .13) than the Smith and Cole returns. Moreover, the correlation between the Smith and Cole return in month t with the Macaulay return in month t+1 is .65, which is almost as large as the contemporaneous correlation (.70). These facts strongly imply that Macaulay used some form of time-averaged data, while Smith and Cole used point-sampled data.

Macaulay [1938, Table 10] Railroad Stocks vs. Cowles [1938, Table P-1] Price Index For All NYSE Stocks, 1871-1937

As mentioned before, the main effect of dividend payments is to increase the total level of returns. Accordingly, I only compare the Macaulay series with the Cowles price index series. They overlap for 66 years, so there is a large sample available for comparison. The returns series are very similar. Both have large first order autocorrelations and the cross-correlations at lead and lag one month are large (.41 and .30). The contemporaneous correlation is .91. In a sense, it is surprising that a portfolio of stocks from a single industry behaves so similarly to a portfolio of stocks that includes many other industries. Usual analyses of diversification suggest that the Cowles returns should have a lower standard deviation.

Dow Jones [1972] vs. Macaulay [1938 Table 10 and Cowles [1939, Table P-1] Price Index

I use the value of the Dow Jones' composite index for the last day in the month to create a point-sampled monthly stock returns series from 1885-1939. The mean returns are similar for the Dow Jones, Macaulay and Cowles series. The standard deviation of the Dow Jones returns is about 20 percent larger. Both the kurtosis and the studentized range statistics are smaller for the Dow Jones returns. The first-order autocorrelation is much smaller for the Dow Jones returns, and the cross-correlations between the Dow Jones return in month t-1 with the Macaulay and Cowles returns in month t are over .6. All of these statistics show the effect of time-averaging on the Cowles and Macaulay series.

Macaulay [1938, Table 10] Railroad Stocks vs. CRSP Value and Equal-weighted Portfolios of all NYSE Stocks without Dividends, 1926-1937

The CRSP portfolios of NYSE stocks (with and without dividends) are ideal for the period after 1926, in the sense that it uses the last trade in the month to measure individual stock prices and the coverage of stocks is the broadest of the alternatives available. Value-weights represent a feasible passive portfolio strategy that involves no trading. Equal-weights represent an active portfolio strategy with monthly rebalancing, but this portfolio gives relatively more weight to smaller capitalization stocks. Thus, it is interesting to compare the behavior of the Macaulay and Cowles portfolios in the period when they overlap with the CRSP data.

This comparison shows important differences between Macaulay's railroad industry portfolio and the larger CRSP portfolios. In particular, the average percent price change is negative for railroad stocks (-.0043) and positive for the broader value-weighted portfolio (.0056). This difference of about 1 percent per month over 11 years implies a large drop in the relative price of railroad stocks. This is not surprising since many railroads went bankrupt during this period (see Warner [1977].) Since the Macaulay data are evidently time-averaged, while the CRSP data are point-sampled at the end of the month, the similar standard deviation estimates imply that the standard deviation of point-sampled railroad stock returns would be much higher (see section 4 for examples.) Moreover, the correlation of the Macaulay return in month t with the CRSP return in month t+1 is .65, which is almost as large as the contemporaneous correlation (.74). This is similar to the previous comparison between the Smith and Cole vs. Macaulay series.

Cowles [1938, Table P-1] Price Index or Total Return Index [Table C-1] vs. CRSP Value and Equal-weighted Price Indexes, or Total Return Indexes, 1926-38

Since all of these indexes cover virtually all NYSE stocks, it is not surprising that they are closely related. The average percentage price change for Cowles and the CRSP value-weighted portfolios are similar, and less than for the CRSP equal-weighted portfolio.[4] As before, the time-averaging built into the Cowles series causes it to have a lower standard deviation, higher first order autocorrelation, and significant lagged cross-correlation with the CRSP return series. In fact, the correlation of the current Cowles return with the previous month's CRSP return is larger than the correlation with the contemporaneous CRSP return.

The relations among the total returns series are virtually identical, except all of the average returns are higher by the average dividend yield (about 0.4 percent per month.)

Thus, the direct comparison of different stock indexes when they overlap leads to three main conclusions:

1. Bank stock returns are much less volatile than railroad or industrial stock returns.
2. Dividend yields raise average returns by an important amount, but have little effect on other statistical behavior.
3. Time-averaged data used by Cowles [1939] and (apparently) Macaulay [1938] leads to less variability, first order autocorrelation, and lagged cross-correlations with point-sampled returns.

[4]This reflects the well-known fact that average returns to small capitalization stocks are higher than for large capitalization stocks. Standard deviations are also higher.

3.3 Time-varying Volatility

Officer [1973] and Schwert [1988, 1989a,b] show that the Depression was a period of very high stock volatility. Figure 1 shows rolling 12 month standard deviation estimates for the CRSP value-weighted, Cowles, Dow Jones and Macaulay return series from 1927-1939.[5] All the series show similar patterns, with volatility rising in late 1929 after the crash, and remaining high through 1934, then rising again in 1937. Thus, there are no important differences among the portfolios in terms of their implications for time-varying volatility.

4. The 'Working Effect' in the Cowles Index

Working [1960] analyzed the effect of time-averaging data that come from a random walk. For example, if the daily S&P composite index follows a random walk, and the monthly S&P index is an average of the daily values in the month, Working's analysis implies that the monthly S&P series would follow an integrated-moving average process of order 1 (IMA(1,1)).[6] The autocorrelation of the changes in the index (or the returns) should be about .25 at lag 1, and 0 at higher lags. The process of averaging the high and low prices for the month, used by Cowles [1939], is similar to time-averaging. In particular, it is unlikely that these prices occur close to each other in calendar time. In addition to first order autocorrelation of returns, time-averaging reduces the variance of returns by about 20 percent. The predictions of Working's analysis are borne out by the comparisons between the Cowles and CRSP value-weighted portfolios in table 2 and figure 1. The standard deviations are lower and the first-order autocorrelation higher for the Cowles series. Moreover, the correlation between the point-sampled returns in month t and the time-averaged returns in month t+1 is high.

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[5]Schwert [1988, 1989a,b] and Pagan and Schwert [1989], among others, argue for more elaborate measures of volatility. Nevertheless, the rolling standard deviation is a reasonable approximation to these better, but more complex measures. The standard deviation for month t is based on the last 12 monthly returns.

[6]See Box and Jenkins [1976] for a description of autoregressive-integrated-moving average (ARIMA) processes. For a related analysis of the effects of nonsynchronous measurement of individual stock returns on portfolio returns, see Lo and MacKinlay [1989].

To gauge the seriousness of this problem, I perform the following experiment (suggested to me by Michael Barclay.) Using the CRSP database of daily stock prices and returns from July 1962 through December 1986, I calculated the average of the high and low closing prices for the days in the month for each stock on the NYSE and AMEX. Then I calculate the return on an equal-weighted portfolio using these "Cowles" prices. Table 3 compares the sample moments, autocorrelations and cross-correlations of the simulated Cowles returns to the with the CRSP equal-weighted portfolio of NYSE and AMEX stocks based on end-of-month prices.

As predicted, the simulated Cowles returns have a large positive autocorrelation at lag 1 (.), and the standard deviation is about 20 percent lower than for the CRSP series. Thus, using average of high and low prices in the month makes the Cowles returns more persistent and less volatile than if they used end-of-month prices.[7] Moreover, the correlation between the CRSP return in month t and the Cowles return in the following month (.59) is almost as large as the correlation in the current month (.69). Thus, the time-averaged return series lags the point-sampled return series.

5. Daily Stock Returns, 1885-1987

5.1 The Dow Jones Indexes

Table 4 contains sample moments and autocorrelations of daily returns to the Dow Jones' indexes for 1885-1896, 1897-1906, 1907-1916, 1917-1927, 1928-1939 and 1885-1939. Because of data collection expense, I have not collected the daily Dow Jones' data after 1939 in machine-readable form. The mean percent price changes are small and positive in each subperiod, although the t-statistics (in parentheses) are generally quite small. This is because the standard deviation of daily returns is comparatively large. It is about .8 percent per day for each subperiod, except 1928-1939, when it is over 1.8 percent per day. Thus, the variance of daily returns more than quadrupled during the 1928-1939 period relative to the previous 40 years experience. The skewness coefficient is reliably negative in the first four subperiods, and positive in the 1928-1939 subperiod. The kurtosis and SR statistics are large in all periods, implying fat-tailed distributions, heteroskedasticity, or

[7]Also see Wilson, Jones and Sylla [1988] for a related analysis of the Cowles return series.

both. The autocorrelations of daily portfolio returns are small. In particular, relative to the later results for the S&P and CRSP portfolios, the autocorrelation coefficient at lag 1 is small.

Table 5 shows means and standard deviations of returns by day-of-the-week. Similar to the evidence in French [1980], Gibbons and Hess [1981] and Keim and Stambaugh [1984], the mean return from the close of trading on Saturday to the close on Monday is negative in each of the subperiods, and most of the other average daily returns are positive. Also, the standard deviation for Saturday is about 25 percent lower than for other days, consistent with the shorter trading hours (about a half day.) The standard deviation on Monday is slightly higher than for other days in some subperiods, but the extra time from the close on Saturday to the close on Monday does not have much effect on volatility. This is similar to the results in French and Roll [1986].

5.2 The S&P Composite Index

Table 6 contains sample moments and autocorrelations of the daily returns to the S&P composite index for 1928-1937, 1938-1947, 1948-1957, 1958-1967, 1968-1977, 1978-1987, and 1928-1987. As with the Dow Jones returns in table 4, the mean percent price changes are small and positive in each sample period. The standard deviation of returns is almost twice as high in the 1928-1937 period as in the later sample periods. In most of the subperiods, the skewness coefficient is reliably negative. The kurtosis and studentized range statistics are large relative to a homoskedastic normal distribution. The very large values in the 1978-1987 subperiod are due to the October 1987 stock market crash, when volatility was very high for a short period (see Schwert [1989b].) The autocorrelation of daily S&P returns is reliably positive at lag 1, and it is over .10 in the 1948-1957, 1958-1967 and 1968-1977 sample periods (it is .27 in the last period.) Fisher [1966] shows how nonsynchronous trading of individual stocks can lead to positive autocorrelation of portfolio returns. Nevertheless, the low first order autocorrelation for the Dow Jones returns in the 19th century, when trading volume was much lower, suggests that infrequent trading cannot explain much of this behavior.[6]

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[6]Lo and MacKinlay [1989] argue that nonsynchronous trading cannot explain much of the autocorrelation patterns in CRSP daily returns.

Table 7 shows means and standard deviations of S&P returns by day-of-the week. As with the Dow Jones returns in table 5, the mean returns for Mondays are negative for all of the sample periods in table 7 (they range from -.13 to -.38 percent per day.) Most of the other average daily returns are positive. Standard deviations are lower for Saturday returns (which stop in 1953), and they are slightly higher for Monday returns.

5.3 CRSP Value and Equal-weighted Portfolios of NYSE and AMEX Stocks

From July 1962 through December 1987, CRSP constructs daily returns to value and equal-weighted portfolios of all NYSE and American Stock Exchange (AMEX) stocks. Table 6 contains sample moments and autocorrelations of these daily returns for 1962-1967, 1968-1977, 1978-1987, and 1962-1987. Table 7 shows means and standard deviations by day-of-the-week. The estimates for the CRSP value-weighted portfolio are very similar to those for the S&P portfolio, since the only differences are the small firms omitted by S&P and the dividends included by CRSP. As with monthly returns, including dividends increases the mean, but has no noticeable effects on the other sample statistics. The CRSP equal-weighted portfolio has a higher mean and standard deviation, and larger first-order autocorrelation, reflecting the influence of small capitalization stocks. Small capitalization stocks tend to be relatively risky, and more thinly traded.

5.4 Comparison of Dow Jones. S&P and CRSP Daily Returns

Table 8 contains cross-correlations between the daily Dow Jones and S&P portfolio returns from 1928-1939, for 6 leads and lags (about 1 week before and after.) There is a large correlation (.97) between the contemporaneous returns (lag 0). Otherwise, the correlations small and of random sign. Table 8 also contains cross-correlations between the daily S&P returns and CRSP value and equal-weighted returns for 1962-1967, 1968-1977, 1978-1987 and 1962-1987. The contemporaneous correlation between the S&P and CRSP value-weighted returns is always .99. The cross-correlation at lag and lead 1 between these series mimics the autocorrelations in table 6 -- they are around .2 at lag 1, and 0 at higher lags.

The cross-correlations between the S&P returns and the CRSP equal-weighted returns are more interesting because they are asymmetric. The correlation at lag 0 is around .85, and the correlation between the S&P return for day t with the CRSP return for day t+1 is around .3. Moreover, the correlations with CRSP returns for days t+2 to t+6 are generally positive, and many are larger than .05. The correlations between the current S&P returns and the lagged CRSP returns are small after 1 day. This pattern implies some form of lagged adjustment of small firms' stock prices to the information reflected in large firms' stock prices.[9]

5.5 Monthly Volatility Estimated from Daily Returns

Monthly standard deviations of returns provide an alternative comparison daily returns. Following French, Schwert and Stambaugh [1987], I use all of the daily returns R_{it} in the month to calculate a standard deviation for month i,

$$\sigma^2(R_{it}) = \{ \sum_{i=1}^{N_t} (R_{it} - \bar{R}_t)^2 + 2 \sum_{i=1}^{N_t - 1} (R_{it} - \bar{R}_t)(R_{i+1t} - \bar{R}_t) \}^{½}, \qquad (6)$$

where there are N_t trading days in month t and $\bar{R}_t$ is the average return in the month. The second term in (6) reflects the large first order autocorrelation in daily portfolio returns. This estimator has the dimension of a monthly instead of a daily standard deviation because it is not divided by the sample size N_t.

Figure 2 plots the monthly standard deviation estimates from the daily Dow Jones and S&P returns for 1928-1939. It is similar to the plots in figure 1 that use monthly data, but it is not smoothed by the 12-month rolling estimator. Each point in figure 2 represents a non-overlapping set of daily data. Most important, the time series of volatility estimates is similar for these two portfolios. The correlation between them is .98.

Thus, the notion of splicing the Dow Jones return series to the S&P series at the beginning of 1928 seems reasonable. During the decade after they first overlap they behave similarly in all respects.

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[9]This point has been made by Lo and MacKinlay [1988,1989] and Mech [1988].

Figure 3 plots the monthly standard deviation estimates from (6) for the S&P and CRSP equal-weighted portfolios from 1962-1987. Because dividends are a small part of stock return volatility, and because ex-dividend days are not concentrated across stocks, there are no important differences between the S&P and CRSP value-weighted volatility estimates (they are correlated .994.) The CRSP equal-weighted volatility estimates are somewhat larger, reflecting the larger risk of small capitalization stocks. Nevertheless, the time path of these alternative estimates is similar.[10] Volatility was high in 1970, 1973-1974, 1982 and especially in late 1987.

6. Combining Different Indexes to Create a Continuous Series

6.1 Methodological Issues

There are several ways that different series of stock returns could be combined to create a continuous series of market returns. First, a simple strategy is to choose the index that is "best" for each month. Of course, to use this strategy one must decide which criterion to use in choosing the best index. For example, it could be: (a) a broad coverage of underlying stocks, or (b) an appealing weighting method for the portfolio, such as value-weights, or (c) point-sampled, end-of-month price measurement for individual stocks, or (d) including dividends, or some combination of these factors. When measuring average returns, including dividends is important. On the other hand, when measuring stock return volatility or autocorrelations, the use of point-sampled, rather than time-averaged, prices is important.

A more complex strategy would involve adjusting the best return series for any known limitations. For example, one could estimate the unmeasured dividend yield and add it back into returns that do not include dividends. Schwert [1988, 1989a] follows this strategy by estimating the dividend yield to the Macaulay [1938] and Smith and Cole [1935] indexes using the average dividend yield to the Cowles [1939] index from 1871-1879.

[10]Schwert and Seguin [1989] show that stock return volatility tends to move together, at least for large portfolios.

6.2 Univariate Corrections for the Effects of Time-averaging

A correction for the effects time-averaged data is not easy. This is a signal extraction problem, where the true (point-sampled) return is measured with serially correlated error. A univariate method to eliminate serial correlation of returns is to estimate a first-order moving average process,

$$R_t = \mu + \varepsilon_t - \theta\varepsilon_{t-1}, \tag{7}$$

where the moving average parameter θ should be about -.3 (since the first-order autocorrelation from a MA(1) process is $-\theta/(1+\theta^2) = .3/1.09 = .27$). The estimate of the point-sampled return is $\hat{R}_t = \hat{\mu} + \hat{\varepsilon}_t$, which has the same mean μ as the original data R_t, but no first-order autocorrelation. Unfortunately, the variance of $\hat{R}_t$, which is the variance of $\hat{\varepsilon}_t$, is less than the variance of the original data, ($Var(\hat{R}_t) = Var(R_t)/(1+\theta^2)$). The analysis in section 4 shows that time-averaging *reduces* the variance of R_t relative to $\hat{R}_t$. This problem can be solved by multiplying the errors $\hat{\varepsilon}$ by a constant $[1.2(1+\theta^2)^{1/2}]$, so the standard deviation of the estimated returns is 20 percent larger than the variance of the raw data, as predicted by section 4. Thus, the filtered return estimate is

$$\hat{R}_t = \hat{\mu} + \hat{\varepsilon}_t\,[1.2(1+\hat{\theta}^2)^{1/2}], \tag{8}$$

where the parameters $\hat{\mu}$ and $\hat{\theta}$, and the residuals $\hat{\varepsilon}_t$ are from (7).

Unfortunately while this procedure corrects the mean, variance and autocorrelations, it does not accommodate cross-correlations with other stock returns. Table 9 contains sample moments and autocorrelations for the corrected Cowles and Macaulay returns $\hat{R}_t$. It also shows cross-correlations of these series with the returns to point-sampled portfolios such as the monthly Dow Jones portfolio and the CRSP value and equal-weighted portfolios.

Comparing the sample moments and autocorrelations for the filtered data in table 9 with the estimates for the raw data in table 1, the corrections in (8) achieve their goal. The standard deviation of $\hat{R}_t$ is about 20 percent larger than for the raw returns R_t, and the first-order autocorrelation is about .25 lower. All of the other statistics are similar.

Unfortunately, the cross-correlations in table 9 show large correlation between the Dow Jones return in month t and the filtered Macaulay or Cowles returns in month t+1. Compared with table

2, the contemporaneous correlation is larger and the lagged correlation is smaller, but the change is not large. This is also true for the cross-correlations of the filtered Macaulay and Cowles returns with the CRSP value and equal-weighted returns. Thus, one can only conclude that the filter in (8) does not solve the time-averaging problem with the Cowles or Macaulay data.

Using the analogy with signal extraction, it is possible to use a Kalman filter to derive the minimum mean square error estimate of the point-sampled data (see Harvey and Pierse [1984].) Unfortunately, the time series behavior of the Kalman filter estimates will be nothing like the behavior of the actual point-sampled returns (if they could be observed.) The estimates will be smoother, with lower variability and positive autocorrelation. Thus, the "optimal" statistical method for correcting the effects of time-averaging yields estimates of returns that are unattractive.

6.3 Estimating Dividend Yields

Many of the stock indexes only measure price changes. As shown above, the main effect of ignoring dividend yields is to lower the mean return estimates. Table 11 contains sample moments, autocorrelations and cross-correlations of monthly dividend yields for the Cowles portfolio from 1871-1938, and for the CRSP value and equal-weighted portfolios of NYSE stocks from 1926-1987. The dividend yield δ_t is the difference between the total return and the capital gain return in month t,

$$\delta_t = R_t - [(P_t - P_{t-1})/P_{t-1}]$$

$$= d_t/P_{t-1}, \qquad (9)$$

where d_t is the cash dividend paid on a portfolio with a price of P_{t-1} at the beginning of the period.

As mentioned before, the average level of dividend yields is about .4 percent per month and the standard deviation of yields is small relative to the standard deviation of percent price changes. Yields are positively autocorrelated and there is a strong seasonal pattern shown by the large positive autocorrelations at lags 3, 6, 9 and 12. As with the cross-correlations of percent price changes in table 2, there is a large positive correlation between the CRSP value-weighted yield in month t and the Cowles yield in month t+1. This probably reflects the effects of time-averaging in the Cowles series.

in table 2 (.0731) shows that stock returns were much more volatile from 1857-1862. On the other hand, if one were to splice the Macaulay returns to the Smith and Cole returns in 1857, the increase in volatility would be masked by the different portfolio weights and the use of time-averaged data. Thus, I use the Smith and Cole returns for this period.

The Macaulay [1938, Table 10] portfolio of railroad stocks is the only choice available for 1863-1870. When using the Macaulay or Cowles returns, I use the filtered estimates from (8) to correct for the time-averaging problem. All the returns from 1802-1870 omit dividend yields. I use the forecasts from (10) to estimate monthly dividend yields for 1802-1870. Thus, the total return series in the Appendix is the sum of the capital gain returns from the price indexes, plus the estimated dividend yields,

$$R_t = \frac{(P_t - P_{t-1})}{P_{t-1}} + \frac{d_t}{P_{t-1}}. \tag{11}$$

For 1871-1885, either the Macaulay or the Cowles [1939, Tables P-1 or C-1] returns can be used. Since the Macaulay portfolio is a subset of the Cowles portfolio, and the Cowles series C-1 includes dividends, the Cowles series is preferred.

For 1885-1925, the Macaulay [1938, Table 10], Cowles [1939, Table P-1 or C-1] or the Dow Jones [1972] portfolio can be used. As before, the Cowles returns dominate the Macaulay returns. The Dow Jones portfolio is smaller than the Cowles portfolio, and it is price-weighted rather than value-weighted. Nevertheless, since it uses end-of-month prices it is probably preferable to the Cowles portfolio that use time-averaged prices. Thus, for March 1885 through the end of 1925, I use the percent price change for the Dow Jones portfolio plus the dividend yield from the Cowles portfolio. From 1926-1987, I use the CRSP value-weighted portfolio of NYSE stocks, including dividends. Table 12 lists the dates and adjustments used to create the combined monthly series.

Table 13 contains sample moments and autocorrelations for the combined monthly returns from 1802-1987, and for 20 year subperiods. The main differences between the estimates in table 13 and the related estimates in tables 1 and 2 are due to the addition of dividend yields, which increases the mean returns, and the correction for time-averaging, which increases the standard deviation and reduces the first-order autocorrelation coefficient. Figure 5 contains a plot of the 12 month rolling estimate of the monthly standard deviation of returns. As noted earlier, the volatility of the early bank stock returns is noticeably lower than for the rest of the data. When railroad stocks enter the portfolio in 1834, there is a large jump in the estimated standard deviation. As discussed by Schwert [1989a], there are many financial crises in the 19^{th} century when stock volatility increased. Of course, the Great Depression stands out as the episode when stock returns were exceptionally volatile.

6.5 Splicing Daily Data

From February 16, 1885 through January 3, 1928, the Dow Jones returns are the only widely available series. An adjustment for daily dividend yields is made by adding the Cowles yield for the month, divided by the number of trading days, δ_t/N_t, to each daily return in the month from 1885-1925. The yield on the CRSP value-weighted portfolio is used in 1926-1927.

From January 4, 1928 through July 2, 1962, the S&P composite portfolio is the best available measure of daily stock returns, since it is value-weighted and it covers a broader range of stocks than the Dow Jones portfolio. The dividend yield on the CRSP value-weighted portfolio divided by the number of trading days is used to estimate the daily dividend yield. From July 3, 1962 through December 31, 1987, the CRSP value-weighted portfolio of NYSE and AMEX stocks is the best available series, since it includes many more stocks than the S&P portfolio and it includes dividends. Table 12 lists the dates and adjustments used to create the combined daily series.

Thus, from February 16, 1885 through December 31, 1987 the combined market return series covers 28,884 days. Table 14 contains sample moments and autocorrelations for the combined daily returns from 1885-1987 and for the decades in that period. The mean returns are higher due to the addition of dividend yields to the Dow Jones and S&P capital gain returns. Otherwise, the estimates in table 14 are similar to those in tables 4 and 6.

Figure 6 plots the estimates of the monthly standard deviation of returns based on daily returns in the month. Because each estimate is based on a nonoverlapping sample of data, this plot is less smooth than figure 5, where the rolling 12-month sample induces artificial smoothness to the plot. There are brief periods in the late 19^{th} century when stock volatility rose and fell back to in table 2 (.0731) shows that stock returns were much more volatile from 1857-1862. On the other hand, if one were to splice the Macaulay returns to the Smith and Cole returns in 1857, the increase in volatility would be masked by the different portfolio weights and the use of time-averaged data. Thus, I use the Smith and Cole returns for this period.

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7. Conclusions

The combined series of monthly returns from 1802-1987 and daily returns from 1885-1987 provide a long historical record of stock price behavior. The estimates in tables 13 and 14 and the plots of volatility in figures 5 and 6 show remarkable homogeneity for these series through time. This is surprising because of the large changes in the U.S. economy over this period, the growth in the proportion of wealth represented by traded common stocks, and the changes in the market microstructure for stock trading. The monthly portfolio grows from 7 bank stocks in 1802-1814 to over 1500 stocks representing a broad spectrum of industries in 1987.

As stressed by Schwert [1988], the most unusual period for stock returns is the Great Depression from 1929-1939. This is most obvious because of the high volatility of returns in figures 5 and 6.

One of the main contributions of this paper is to identify and correct the deficiencies of some of the early indexes of stock prices. In particular, the use of time-averaged data by Cowles [1939] (and apparently Macaulay [1938]) induces positive autocorrelation of returns and reduces the variability of returns. Also, most of the pre-CRSP indexes do not include dividends in measuring returns. I show that this mainly affects estimates of mean returns. I estimate the dividend yields for 1802-1870.

Because of the recent interest in long-run behavior of stock prices (Fama and French [1988a,b]), and concerns that the CRSP dataset has been analyzed too frequently (Merton [1987]), these new estimates of pre-1926 stock returns are important for both economic historians and financial economists. For example, Romer [1986a,b, 1989] and Shapiro [1988] have studied macroeconomic volatility in the 19^{th} century to see whether stabilization policies adopted after World War II have had an important effect in reducing fluctuations.

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Table 1 -- Sample Mean, Standard Deviation, Skewness, Excess Kurtosis, Studentized Range and 12 Autocorrelations of Monthly Portfolio Returns, 1802-1987

Source, Type of Stocks	Sample Period, Size, T	Mean	Std Dev	Skew	Kurt	SR	Autocorrelation at Lag 1	2	3	4	5	6	7	8	9	10	11	12	Q(12)
Smith and Cole [1935] Table 61 Banks	1802-1820 227	-.0008 (-.74)	.0159	-.30	8.10	11.03	.03	.07	.11	-.08	-.08	.01	-.01	-.09	.08	.00	-.09	.14	17.6 (.13)
Smith and Cole [1935] Table 62 Banks and Insurance	1815-1845 369	.0001 (.13)	.0212	-.86	9.04	11.86	.17	-.02	-.10	-.03	.09	.03	.03	-.01	-.05	.00	.04	.15	28.6 (.004)
Smith and Cole [1935] Table 69 Railroads	1834-1845 143	.0026 (.62)	.0508	.46	1.04	6.37	.21	-.07	.01	-.02	-.04	.06	.07	.01	.13	.13	.12	.11	18.0 (.12)
Smith and Cole [1935] Table 70 Railroads	1843-1862 239	.0041 (1.23)	.0518	-.48	4.12	8.17	.12	-.10	.12	.02	-.01	.04	-.05	-.05	.00	.01	-.03	.08	13.5 (.34)
Macaulay [1938] Table 10 Railroads	1857-1937 956	.0020 (1.31)	.0481	2.06	34.12	18.60	.40	-.01	-.15	-.08	.05	.11	.11	.10	.11	.10	.02	-.06	239.9 (.00)
Cowles [1939] Table P-1 All NYSE Stocks, Prices Only	1871-1938 811	.0023 (1.43)	.0458	1.21	19.74	15.95	.31	-.01	-.13	-.01	.09	.08	.06	.05	.11	.05	.02	-.04	126.7 (.00)
Cowles [1939] Table C-1 All NYSE Stocks, with Dividends	1871-1938 811	.0064 (3.99)	.0457	1.20	19.75	16.03	.31	-.02	-.14	-.02	.09	.08	.06	.05	.11	.05	.01	-.04	126.7 (.00)
Dow-Jones [1972] Industrials & RR's, Prices Only	1885-1939 655	.0032 (1.33)	.0614	.47	7.78	11.44	.10	.01	-.15	.02	.10	-.03	.07	.10	.04	.03	-.04	-.03	42.6 (.00)
CRSP VW Prices Only	1926-1987 744	.0055 (2.62)	.0571	.26	7.62	11.68	.11	-.01	-.12	.02	.08	-.03	.00	.04	.09	.00	-.03	.00	32.3 (.001)
CRSP VW with Dividends	1926-1987 744	.0093 (4.42)	.0571	.27	7.62	11.65	.11	-.01	-.12	.02	.08	-.03	.00	.04	.08	.00	-.03	.00	33.1 (.001)
CRSP EW Prices Only	1926-1987 744	.0095 (3.32)	.0785	1.74	15.15	12.35	.18	.01	-.11	-.06	.01	-.05	.00	.03	.16	.07	-.02	.01	62.4 (.00)
CRSP EW with Dividends	1926-1987 744	.0130 (4.51)	.0784	1.73	15.07	12.34	.19	.01	-.11	-.06	.01	-.05	.00	.03	.16	.07	-.02	.01	62.9 (.00)

Note: Sample moments are calculated for monthly stock returns for which data are available. The t-statistic for the sample mean is in parentheses below it. Excess kurtosis should be 0 for a normal distribution. The studentized range (SR) is the sample range divided by the sample standard deviation, see David, Hartley and Pearson [1954]. The Box-Pierce [1970] statistic Q(12) measures the joint significance of the 12 lags of the autocorrelations, with the p-value in parentheses below it. CRSP value (VW) and equal weighted (EW) portfolios of all NYSE stocks are from the Center for Research in Security Prices at the University of Chicago.

Table 2 -- Comparison of Smith and Cole [1935], Macaulay [1938], Cowles [1939], Dow Jones [1972] and CRSP Monthly Portfolio Returns for Common Sample Periods

Sample Means, Standard Deviations, Skewness, Excess Kurtosis, Studentized Range, Autocorrelations and Cross-correlations

First series, r1 / Second series, r2	Sample Period, Size, T	Mean	Std Dev	Skew	Kurt	SR	Autocorrelation at lag 1	2	3	Cross-correlations at lag k corr(r1(t),r2(t+k)) +3	+2	+1	0	-1	-2	-3
SC(61)	1815-	.0003	.0184	1.39	7.30	6.92	-.06	.02	.11							
vs.	1820									.11	.00	.06	.54	.02	.20	.02
SC(62)	70	-.0001	.0200	-.14	.46	4.81	-.11	.20	.10							
SC(62)	1834-	-.0001	.0278	-.92	7.19	9.06	.30	-.10	-.15							
vs.	1845									-.01	-.03	.18	.52	.23	.00	-.14
SC(69)	143	.0026	.0508	.46	1.04	6.37	.21	-.08	.01							
SC(70)	1857-	.0056	.0731	-.75	2.34	5.79	.13	-.13	.09							
vs.	1862									.12	-.06	-.09	.69	.66	-.06	-.02
Macaulay	71	.0027	.0502	-.43	1.92	5.87	.24	-.09	.00							
Macaulay	1871-	.0015	.0495	2.34	36.66	18.06	.42	.00	-.19							
vs.	1937									-.17	.02	.40	.91	.30	-.03	-.14
Cowles (Price)	792	.0026	.0449	1.28	21.53	16.27	.31	-.01	-.14							
Dow-Jones	1885-	.0036	.0592	.55	8.81	11.86	.14	-.02	-.15							
vs.	1937									-.10	.07	.61	.68	.10	-.13	-.13
Macaulay	619	.0018	.0534	2.37	34.33	16.77	.42	-.01	-.20							
vs.										-.08	.09	.67	.65	.02	-.11	-.08
Cowles (Price)		.0033	.0479	1.32	20.93	15.26	.30	-.02	-.15							
Macaulay	1926-	.0003	.0990	1.81	12.23	9.04	.48	-.02	-.27							
vs.	1937									-.18	-.23	.17	.70	.69	.09	-.15
CRSP-VW (Price)	133	.0056	.0918	.63	4.09	7.26	.24	-.08	-.24							
vs.										-.25	-.21	.17	.75	.67	.12	-.12
CRSP-EW (Price)		.0150	.1336	1.85	7.46	7.26	.34	-.04	-.20							
Cowles (Price)	1926-	.0026	.0806	1.21	9.34	9.07	.33	-.04	-.22							
vs.	1938									-.11	-.19	.08	.59	.80	.07	-.11
CRSP-VW (Price)	156	.0035	.0923	.55	3.59	7.22	.18	-.02	-.22							
vs.										-.18	-.18	.07	.64	.74	.09	-.09
CRSP-EW (Price)		.0111	.1330	1.64	6.62	7.29	.27	.00	-.17							
Cowles (w/div)	1926-	.0064	.0804	1.21	9.36	9.11	.33	-.04	-.23							
vs.	1938									-.12	-.20	.08	.58	.80	.07	-.12
CRSP-VW (w/div)	156	.0075	.0922	.56	3.62	7.21	.18	-.03	-.23							
vs.										-.18	-.18	.07	.63	.75	.09	-.10
CRSP-EW (w/div)		.0140	.1327	1.64	6.62	7.29	.27	.00	-.17							

Note: Sample moments are calculated for monthly stock returns for the period of overlap. The cross-correlation at lag k measures the correlation of the return r1 at time t with the return r2 at time t+k.

See note to table 1 for further information.

Table 3 -- Comparison of Simulated 'Cowles-type' Monthly Returns to NYSE and AMEX Stocks versus CRSP Equal-weighted Point-sampled Monthly Return to NYSE and AMEX Stocks, 1962-1986

Sample Means, Standard Deviations, Skewness, Excess Kurtosis, Studentized Range,

Autocorrelations and Cross-correlations

							Autocorrelation at lag			Cross-correlations at lag k corr(r1(t),r2(t+k))						
First series, r1 *Second series, r2*	*Sample Period, Size, T*	*Mean*	*Std Dev*	*Skew*	*Kurt*	*SR*	*1*	*2*	*3*	*+3*	*+2*	*+1*	*0*	*-1*	*-2*	*-3*
'Cowles'	1962-	.0082	.0347	-.39	.91	6.56	.29	-.01	.04							
vs.	1986									.05	-.02	.00	.69	.59	-.04	.03
CRSP	292	.0093	.0430	.10	.90	6.62	.01	-.03	.03							

Note: Sample moments are calculated for monthly stock returns for the period of overlap. The cross-correlation at lag k measures the correlation of the return r1 at time t with the return r2 at time t+k. See note to table 1 for further information.

Table 4 -- Sample Mean, Standard Deviation, Skewness, Excess Kurtosis, Studentized Range and 6 Autocorrelations of Daily Percentage Dow Jones [1972] Portfolio Returns, 1885-1939

Sample Period, Size, T	*Mean*	*Std Dev*	*Skew*	*Kurt*	*SR*	*Autocorrelation at Lag* 1	2	3	4	5	6	Q(6)
1885-1896	.0033	.8739	-.21	11.02	17.31	-.01	-.02	.03	.02	.03	-.01	11.1
3593	(.22)											(.09)
1897-1906	.0339	.8578	-.36	8.68	15.70	-.03	-.04	.04	.08	.05	-.05	43.4
2990	(2.16)											(.00)
1907-1916	.0027	.7687	-.47	10.86	18.19	-.01	-.01	.00	.05	.08	-.01	27.5
2885	(.19)											(.00)
1917-1927	.0196	.8034	-.31	6.51	14.10	.03	-.03	.02	.00	.03	.00	9.8
3288	(1.40)											(.13)
1928-1939	.0021	1.813	.44	10.18	14.93	.02	-.01	.00	.05	.02	-.04	17.3
3574	(.07)											(.01)
1885-1939	.0118	1.121	.30	17.45	24.15	.01	-.02	.01	.04	.03	-.03	67.8
16330	(1.34)											(.00)

Note: Sample moments are calculated for daily stock returns for which data are available. All daily returns are expressed as percentage returns (multiplied by 100.) The t-statistic for the sample mean is in parentheses below it. Excess kurtosis should be 0. for a normal distribution. The studentized range (SR) is the sample range divided by the sample standard deviation, see David, Hartley and Pearson [1954]. The Box-Pierce [1970] statistic Q(6) measures the joint significance of the 6 lags of the autocorrelations, with the p-value in parentheses below it.

Table 5 -- Sample Means and Standard Deviations by Day-of-the-Week for Daily Percentage Dow Jones [1972] Portfolio Returns, 1885-1939

Sample Period, Size, T	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
A. Means of Percentage Returns by Day-of-the-Week						
1885-1896 3593	-.1158	.0199	.0623	-.0204	.0600	.0117
1897-1906 2990	-.0300	.0776	.0594	-.0169	.1523	-.0443
1907-1916 2885	-.0296	.0203	-.0415	-.0050	.0328	.0412
1917-1927 3288	-.1547	-.0011	.0336	.0365	.1077	.0916
1928-1939 3574	-.3270	.0659	.0915	.0509	.0325	.0932
1885-1939 16330	-.1388	.0364	.0439	.0101	.0758	.0406
B. Standard Deviations of Percentage Returns by Day-of-the-Week						
1885-1896 3593	.9519	.8690	.9317	.8344	.9345	.6846
1897-1906 2990	.9939	.8525	.8502	.8537	.8537	.7046
1907-1916 2885	.8267	.7954	.7220	.8279	.8186	.5879
1917-1927 3288	.8807	.8183	.8589	.8655	.7729	.5499
1928-1939 3574	1.872	1.734	2.101	1.748	1.949	1.336
1885-1939 16330	1.197	1.098	1.237	1.108	1.182	.8401

Table 6 -- Sample Mean, Standard Deviation, Skewness, Excess Kurtosis, Studentized Range and 6 Autocorrelations of Daily Percentage S&P and CRSP Portfolio Returns, 1928-1987

Sample Period, Size, T	*Mean*	*Std Dev*	*Skew*	*Kurt*	*SR*	Autocorrelation at Lag 1	2	3	4	5	6	Q(6)
				A. S&P Composite Portfolio								
1928-1937 2973	.0012 (.03)	1.933	.38	10.07	14.97	.02	-.04	-.02	.05	.02	-.05	25.0 (.00)
1938-1947 2954	.0187 (.92)	1.107	-.10	10.48	15.44	.06	-.03	.05	.03	.01	.01	23.9 (.00)
1948-1957 2658	.0388 (2.74)	.7298	-.85	9.81	15.22	.11	-.07	-.01	.02	.05	-.01	51.2 (.00)
1958-1967 2518	.0369 (2.99)	.6195	-.46	12.49	18.28	.15	-.04	.02	.05	.01	-.01	70.4 (.00)
1968-1977 2497	.0029 (.18)	.8397	.33	5.45	10.35	.27	-.01	.02	.01	-.03	-.07	191.6 (.00)
1978-1987 2528	.0434 (1.43)	1.044	-2.85	65.37	28.24	.08	-.04	-.03	-.04	.06	.03	37.6 (.00)
1928-1987 16128	.0231 (2.53)	1.158	-.07	23.39	31.95	.06	-.04	.00	.03	.02	-.03	126.0 (.00)
				B. CRSP Value-weighted Portfolio of NYSE and AMEX Stocks								
1962-1967 1384	.0570 (3.87)	.5480	-.14	7.94	12.26	.16	.02	.06	.04	.04	.00	44.8 (.00)
1968-1977 2497	.0168 (1.01)	.8295	.29	5.56	10.60	.30	.00	.03	.02	-.02	-.06	243.7 (.00)
1978-1987 2528	.0611 (3.15)	.9759	-2.50	54.96	27.56	.13	-.02	-.02	-.03	.07	.04	65.3 (.00)
1962-1987 6409	.0430 (4.09)	.8419	-1.44	41.34	31.95	.20	-.01	.01	.00	.03	.00	265.4 (.00)
				C. CRSP Equal-weighted Portfolio of NYSE and AMEX Stocks								
1962-1967 1384	.1035 (6.73)	.5725	-.83	8.29	10.87	.30	.09	.12	.09	.11	.04	185.2 (.00)
1968-1977 2497	.0432 (2.50)	.8661	.33	7.54	13.42	.46	.13	.15	.15	.09	.02	697.5 (.00)
1978-1987 2528	.0848 (4.94)	.8631	-2.11	47.36	27.83	.27	.04	.02	.06	.12	.09	249.4 (.00)
1962-1987 6409	.0727 (7.18)	.8107	-.93	28.12	29.63	.36	.09	.09	.10	.10	.05	1064.7 (.00)

Note: Sample moments are calculated for daily stock returns for which data are available. All daily returns are expressed as percentage returns (multiplied by 100.) The t-statistic for the sample mean is in parentheses below it. Excess kurtosis should be 0 for a normal distribution. The studentized range (SR) is the sample range divided by the sample standard deviation, see David, Hartley and Pearson [1954]. The Box-Pierce [1970] statistic Q(6) measures the joint significance of the 6 lags of the autocorrelations, with the p-value in parentheses below it.

Table 7 -- Sample Means and Standard Deviations by Day-of-the-Week for Daily Percentage S&P and CRSP Portfolio Returns, 1828-1987

Sample Period, Size, T	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
			A. Means of Percentage Returns by Day-of-the-Week			
Standard & Poor's Composite Portfolio						
1928-1937	-.3759	.0346	.1163	.0796	.0634	.0844
1938-1947	-.1416	.0731	.0211	.0113	-.0508	.2131
1948-1957	-.1875	-.0047	.1305	.0797	.1374	.1411
1958-1967	-.1411	.0405	.0917	.0640	.1251	NA
1968-1977	-.1484	-.0088	.0818	.0260	.0606	NA
1978-1987	-.1278	.0701	.1374	.0451	.0824	NA
1928-1987	-.1872	.0341	.0966	.0510	.0697	.1465
CRSP Value-weighted Portfolio of NYSE and AMEX Stocks						
1962-1967	-.0997	.0638	.1252	.0666	.1247	NA
1968-1977	-.1330	-.0057	.0858	.0464	.0873	NA
1978-1987	-.1193	.0702	.1547	.0719	.1188	NA
1962-1987	-.1204	.0390	.1219	.0608	.1077	NA
CRSP Equal-weighted Portfolio of NYSE and AMEX Stocks						
1962-1967	-.0644	.0546	.1598	.1377	.2257	NA
1968-1977	-.1283	-.0409	.1023	.0754	.2050	NA
1978-1987	-.1660	.0119	.1801	.1494	.2386	NA
1962-1987	-.1291	.0001	.1460	.1180	.2227	NA
			B. Standard Deviations of Percentage Returns by Day-of-the-Week			
Standard & Poor's Composite Portfolio						
1928-1937	2.043	1.787	2.282	1.920	2.020	1.361
1938-1947	1.118	1.359	1.105	1.045	1.089	.8100
1948-1957	.8407	.7702	.7426	.6499	.6483	.4599
1958-1967	.7135	.6465	.6072	.5654	.5157	NA
1968-1977	.9107	.7991	.8956	.7904	.7819	NA
1978-1987	1.197	1.098	1.237	1.108	1.182	NA
1928-1987	1.259	1.128	1.226	1.078	1.102	1.060
CRSP Value-weighted Portfolio of NYSE and AMEX Stocks						
1962-1967	.6012	.5937	.5762	.4729	.4512	NA
1968-1977	.9111	.7786	.8850	.7879	.7621	NA
1978-1987	1.311	.9007	.9036	.8679	.8136	NA
1962-1987	1.036	.7963	.8354	.7656	.7288	NA
CRSP Equal-weighted Portfolio of NYSE and AMEX Stocks						
1962-1967	.6698	.5948	.5560	.4985	.4872	NA
1968-1977	.9980	.7782	.8802	.8488	.7782	NA
1978-1987	1.112	.7745	.8291	.7440	.7574	NA
1962-1987	.9852	.7421	.7990	.7435	.7165	NA

Note: The New York Stock Exchange traded for ½ day on Saturdays from 1928 through May 1952. "NA" indicates Saturday returns are not available.

Table 8 -- Cross-correlations of Daily Returns to the Dow Jones [1972], Standard & Poor's [1986] and CRSP Value and Equal-weighted Portfolios for Common Sample Periods

First series, r1 *Second series, r2*	*Sample Period, Size, T*	*Cross-correlations at lag k corr(r1(t),r2(t+k))* +6	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-5	-6
Dow Jones vs. S&P	1928-1939 3574	-.05	.01	.05	-.01	-.03	.01	.97	.04	-.02	-.01	.05	.03	-.03
S&P vs. CRSP VW	1962-1967 1384	.00	.04	.05	.06	.02	.16	.99	.14	.01	.05	.02	.03	-.01
vs. CRSP EW		.04	.09	.08	.10	.04	.26	.86	.12	.01	.02	.01	.02	-.03
S&P vs. CRSP VW	1968-1977 2497	-.06	-.02	.02	.03	.00	.30	.99	.27	-.01	.02	.01	-.03	-.06
vs. CRSP EW		-.02	.05	.11	.10	.07	.42	.85	.20	-.02	.01	.01	-.03	-.05
S&P vs. CRSP VW	1978-1987 2528	.04	.07	-.04	-.02	-.03	.14	.99	.07	-.03	-.03	-.03	.06	.03
vs. CRSP EW		.07	.10	-.01	.03	.00	.34	.84	.01	-.02	-.05	.01	.05	.02
S&P vs. CRSP VW	1962-1987 6409	.00	.03	-.01	.01	-.01	.20	.99	.15	-.02	-.01	-.01	.02	-.01
vs. CRSP EW		.03	.08	.05	.06	.03	.36	.84	.10	-.02	-.02	.01	.01	-.01

Note: The cross-correlation at lag k measures the correlation of the return r1 at time t with the return r2 at time t+k.

Table 9 -- Comparison of Filtered Time-averaged Returns $\hat{R}_t$ with Returns to Point-sampled Indexes R_t

$$R_t = \hat{\mu} + \hat{\varepsilon}_t - \hat{\theta}\,\hat{\varepsilon}_{t-1} \tag{7}$$

$$\hat{R}_t = \hat{\mu} + 1.2\,(1+\hat{\theta}^2)^{1/2}\,\hat{\varepsilon}_t \tag{8}$$

Sample Means, Standard Deviations, Skewness, Excess Kurtosis, Studentized Range, Autocorrelations and Cross-correlations

Series	Sample Period, Size, T	Mean	Std Dev	Skew	Kurt	SR	Autocorrelation at lag 1	2	3
Macaulay	1857-1937 956	.0020	.0554	2.08	31.74	18.39	.15	-.01	-.15
Cowles (Price)	1871-1938 815	.0023	.0545	1.24	20.49	15.67	.03	.02	-.15
Cowles (w/div)	1871-1938 815	.0064	.0543	1.23	20.50	15.71	.04	.02	-.15

First series, r1 / Second series, r2		Cross-correlations at lag k corr(r1(t),r2(t+k)): +3	+2	+1	0	-1	-2	-3
Dow Jones vs. Macaulay	1885-1937 624	-.09	-.06	.45	.71	.14	-.10	-.14
Dow Jones vs. Cowles P-1	1885-1938 647	-.04	-.08	.52	.64	.06	-.08	-.09
Macaulay vs. CRSP VW	1926-1937 133	-.18	-.20	.26	.71	.55	-.07	-.15
vs. CRSP EW		-.25	-.16	.24	.78	.51	-.02	-.13
Cowles P-1 vs. CRSP VW	1926-1938 156	-.12	-.17	.13	.58	.67	-.13	-.08
vs. CRSP EW		-.17	-.14	.12	.64	.60	-.08	-.07
Cowles C-1 vs. CRSP VW	1926-1938 156	-.13	-.17	.13	.58	.67	-.13	-.09
vs. CRSP EW		-.17	-.14	.12	.64	.60	-.08	-.08

Note: The filtered series $\hat{R}_t$ is the intercept $\hat{\mu}$ plus the residual from the first order moving average process in (7) $\hat{\varepsilon}_t$, scaled so that it has a standard deviation 20 percent larger than the time-averaged returns R_t. The cross-correlation at lag k measures the correlation of the return r1 at time t with the return r2 at time t+k. See note to table 1 for further information.

Table 10 -- Comparison of Monthly Dividend Yields to the Cowles [1939] and CRSP Value and Equal-weighted Portfolios

Sample Means, Standard Deviations, Skewness, Excess Kurtosis, Studentized Range, Autocorrelations and Cross-correlations

A. Sample Moments for Full Sample Periods

Series	Sample Period, Size, T	Mean	Std Dev	Skew	Kurt	SR	Autocorrelation at lag 1	2	3	4	5	6	7	8	9	10	11	12
Cowles	1871-1938 815	.0042	.0021	1.08	2.06	6.76	-.11	-.06	.52	-.07	-.01	.59	-.04	-.05	.47	-.10	-.01	.59
CRSP VW	1926-1987 744	.0038	.0023	1.08	1.62	6.90	-.15	-.20	.82	-.20	-.19	.83	-.20	-.20	.78	-.24	-.17	.89
CRSP EW	1926-1987 744	.0034	.0018	1.67	4.56	7.41	.16	.04	.69	.02	.05	.73	.02	.01	.65	-.03	.12	.87

B. Cross-correlations Between Dividend Yield Series for Overlapping Samples

First series, y1 Second series, y2	Sample Period, Size, T	Cross-correlations at lag k corr(y1(t),y2(t+k)): +3	+2	+1	0	-1	-2	-3
Cowles vs. CRSP VW	1926-1938 156	.32	.38	-.45	.54	.62	-.43	.35
vs. CRSP EW		.50	-.08	-.26	.80	.12	-.26	.56
CRSP VW vs. CRSP EW	1926-1987 744	.61	.13	-.24	.81	.26	-.30	.61

Note: Sample moments are calculated for monthly dividend yields for which data are available. Excess kurtosis should be 0 for a normal distribution. The studentized range (SR) is the sample range divided by the sample standard deviation, see David, Hartley and Pearson [1954]. The cross-correlation at lag k measures the correlation of the yield y1 at time t with the yield y2 at time t+k.

Table 9 -- Comparison of Filtered Time-averaged Returns $\hat{R}_t$ with Returns to Point-sampled Indexes R_t

$$R_t = \hat{\mu} + \hat{\varepsilon}_t - \hat{\theta}\, \hat{\varepsilon}_{t-1} \tag{7}$$

$$\hat{R}_t = \hat{\mu} + 1.2\,(1+\hat{\theta}^2)^{1/2}\, \hat{\varepsilon}_t \tag{8}$$

Sample Means, Standard Deviations, Skewness, Excess Kurtosis, Studentized Range, Autocorrelations and Cross-correlations

Series	Sample Period, Size, T	Mean	Std Dev	Skew	Kurt	SR	Autocorrelation at lag 1	2	3
Macaulay	1857-1937 956	.0020	.0554	2.08	31.74	18.39	.15	-.01	-.15
Cowles (Price)	1871-1938 815	.0023	.0545	1.24	20.49	15.67	.03	.02	-.15
Cowles (w/div)	1871-1938 815	.0064	.0543	1.23	20.50	15.71	.04	.02	-.15

First series, r1 / Second series, r2		Cross-correlations at lag k corr(r1(t),r2(t+k)) +3	+2	+1	0	-1	-2	-3
Dow Jones vs. Macaulay	1885-1937 624	-.09	-.06	.45	.71	.14	-.10	-.14
Dow Jones vs. Cowles P-1	1885-1938 647	-.04	-.08	.52	.64	.06	-.08	-.09
Macaulay vs. CRSP VW	1926-1937 133	-.18	-.20	.26	.71	.55	-.07	-.15
vs. CRSP EW		-.25	-.16	.24	.78	.51	-.02	-.13
Cowles P-1 vs. CRSP VW	1926-1938 156	-.12	-.17	.13	.58	.67	-.13	-.08
vs. CRSP EW		-.17	-.14	.12	.64	.60	-.08	-.07
Cowles C-1 vs. CRSP VW	1926-1938 156	-.13	-.17	.13	.58	.67	-.13	-.09
vs. CRSP EW		-.17	-.14	.12	.64	.60	-.08	-.08

Note: The filtered series $\hat{R}_t$ is the intercept $\hat{\mu}$ plus the residual from the first order moving average process in (7) $\hat{\varepsilon}_t$, scaled so that it has a standard deviation 20 percent larger than the time-averaged returns R_t. The cross-correlation at lag k measures the correlation of the return r1 at time t with the return r2 at time t+k. See note to table 1 for further information.

Table 10 -- Comparison of Monthly Dividend Yields to the Cowles [1939] and CRSP Value and Equal-weighted Portfolios

Sample Means, Standard Deviations, Skewness, Excess Kurtosis, Studentized Range, Autocorrelations and Cross-correlations

A. Sample Moments for Full Sample Periods

							Autocorrelation at lag											
Series	*Sample Period, Size, T*	*Mean*	*Std Dev*	*Skew*	*Kurt*	*SR*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
Cowles	1871-1938 815	.0042	.0021	1.08	2.06	6.76	-.11	-.06	.52	-.07	-.01	.59	-.04	-.05	.47	-.10	-.01	.59
CRSP VW	1926-1987 744	.0038	.0023	1.08	1.62	6.90	-.15	-.20	.82	-.20	-.19	.83	-.20	-.20	.78	-.24	-.17	.89
CRSP EW	1926-1987 744	.0034	.0018	1.67	4.56	7.41	.16	.04	.69	.02	.05	.73	.02	.01	.65	-.03	.12	.87

B. Cross-correlations Between Dividend Yield Series for Overlapping Samples

		Cross-correlations at lag k corr(y1(t),y2(t+k))						
First series, y1 Second series, y2	*Sample Period, Size, T*	*+3*	*+2*	*+1*	*0*	*-1*	*-2*	*-3*
Cowles vs. CRSP VW	1926-1938 156	.32	.38	-.45	.54	.62	-.43	.35
vs. CRSP EW		.50	-.08	-.26	.80	.12	-.26	.56
CRSP VW vs. CRSP EW	1926-1987 744	.61	.13	-.24	.81	.26	-.30	.61

Note: Sample moments are calculated for monthly dividend yields for which data are available. Excess kurtosis should be 0 for a normal distribution. The studentized range (SR) is the sample range divided by the sample standard deviation, see David, Hartley and Pearson [1954]. The cross-correlation at lag k measures the correlation of the yield y1 at time t with the yield y2 at time t+k.

Table 13 -- Sample Mean, Standard Deviation, Skewness, Excess Kurtosis, Studentized Range and 12 Autocorrelations of Combined Monthly Portfolio Returns, 1802-1987

Sample Period, Size, T	*Mean*	*Std Dev*	*Skew*	*Kurt*	*SR*	*Autocorrelation at Lag* 1	2	3	4	5	6	7	8	9	10	11	12	Q(12)
1802-1987 2227	.0071 (7.36)	.0455	.14	8.09	14.61	.09	-.01	-.05	.01	.06	-.02	.01	.03	.04	.03	.00	.00	43.9 (.00)
1802-1820 227	.0034 (3.37)	.0152	-1.15	4.91	8.48	.03	.11	.10	-.07	-.03	.03	.03	-.03	.01	.05	-.13	.15	17.3 (.14)
1821-1840 240	.0044 (2.47)	.0276	.96	5.01	8.17	.17	-.12	-.14	-.06	-.04	.01	.04	.06	.08	.08	.13	.00	25.8 (.01)
1841-1860 240	.0044 (1.41)	.0479	-.46	4.22	8.76	.14	-.10	.14	-.03	-.09	.00	-.09	-.08	.01	.02	-.01	.15	23.5 (.02)
1861-1880 240	.0102 (3.82)	.0414	-.25	4.01	8.69	.06	.01	.06	.04	.00	-.04	.07	.06	.02	.14	.11	-.02	12.9 (.37)
1881-1900 240	.0059 (1.99)	.0458	.10	1.00	6.92	.04	-.05	-.08	-.05	.08	-.13	.06	.07	-.02	.02	-.01	-.04	11.6 (.48)
1901-1920 236	.0052 (1.94)	.0414	-.46	0.63	5.99	-.03	.15	-.01	.06	.10	-.06	.05	.03	-.06	.02	.02	-.08	13.5 (.33)
1921-1940 240	.0088 (1.71)	.0797	.43	4.99	8.34	.13	-.01	-.21	.00	.07	.00	.03	.09	.13	.05	-.04	-.02	24.3 (.02)
1941-1960 240	.0119 (5.05)	.0364	-.37	-.33	5.41	.08	.04	.02	.07	.06	-.03	.07	.03	-.04	-.11	.01	.01	9.7 (.64)
1961-1980 240	.0079 (2.81)	.0433	-.04	0.99	6.56	.04	-.06	.05	.08	.08	-.11	-.11	-.07	.06	-.05	-.01	.08	15.5 (.22)
1981-1987 84	.0117 (2.14)	.0500	-.82	4.44	6.89	.08	-.03	-.05	-.08	.20	.01	-.03	-.12	-.14	.05	-.04	-.05	8.9 (.71)

Note: Sample moments are calculated for the combined monthly stock returns, including dividends. The t-statistic for the sample mean is in parentheses below it. Excess kurtosis should be 0 for a normal distribution. The studentized range (SR) is the sample range divided by the sample standard deviation, see David, Hartley and Pearson [1954]. The Box-Pierce [1970] statistic Q(12) measures the joint significance of the 12 lags of the autocorrelations, with the p-value in parentheses below it.

Table 14 -- Sample Mean, Standard Deviation, Skewness, Excess Kurtosis, Studentized Range and 6 Autocorrelations of Combined Daily Portfolio Returns, 1885-1987

Sample Period, Size, T	*Mean*	*Std Dev*	*Skew*	*Kurt*	*SR*	Autocorrelation at Lag 1	2	3	4	5	6	Q(6)
1885-1987 28884	.0395 (6.58)	1.019	-.06	21.38	34.04	.05	-.03	.01	.04	.03	-.02	182.6 (.00)
1885-1896 3593	.0175 (1.20)	.8738	-.21	11.02	17.33	-.01	-.02	.03	.02	.03	-.01	11.0 (.09)
1897-1906 2990	.0474 (3.02)	.8578	-.36	8.69	15.70	-.03	-.04	.04	.08	.05	-.05	43.5 (.00)
1907-1916 2885	.0202 (1.41)	.7688	-.47	10.85	18.19	-.01	-.01	.00	.05	.08	-.01	27.5 (.00)
1917-1927 3288	.0403 (2.88)	.8034	-.31	6.53	14.11	.03	-.03	.02	.00	.03	.00	9.8 (.14)
1928-1937 2973	.0170 (0.48)	1.933	.38	10.09	14.99	.01	-.04	-.02	.05	.02	-.05	25.0 (.00)
1938-1947 2954	.0365 (1.79)	1.107	-.10	10.47	15.44	.06	-.03	.05	.03	.01	.01	23.8 (.00)
1948-1957 2658	.0593 (4.19)	.7296	-.85	9.79	15.22	.11	-.07	-.01	.02	.05	-.01	51.1 (.00)
1958-1967 2518	.0586 (4.83)	.6098	-.55	13.02	18.57	.17	-.03	.03	.05	.01	-.01	81.3 (.00)
1968-1977 2497	.0313 (1.88)	.8295	.29	5.56	10.59	.30	.00	.03	.02	-.02	-.06	243.8 (.00)
1978-1987 2528	.0800 (4.12)	.9763	-2.51	54.97	27.55	.13	-.02	-.02	-.03	.07	.04	65.6 (.00)

Note: Sample moments are calculated for the combined daily stock returns, including dividends. All daily returns are expressed as percentage returns (multiplied by 100.) The t-statistic for the sample mean is in parentheses below it. Excess kurtosis should be 0 for a normal distribution. The studentized range (SR) is the sample range divided by the sample standard deviation, see David, Hartley and Pearson [1954]. The Box-Pierce [1970] statistic Q(6) measures the joint significance of the 6 lags of the autocorrelations, with the p-value in parentheses below it.

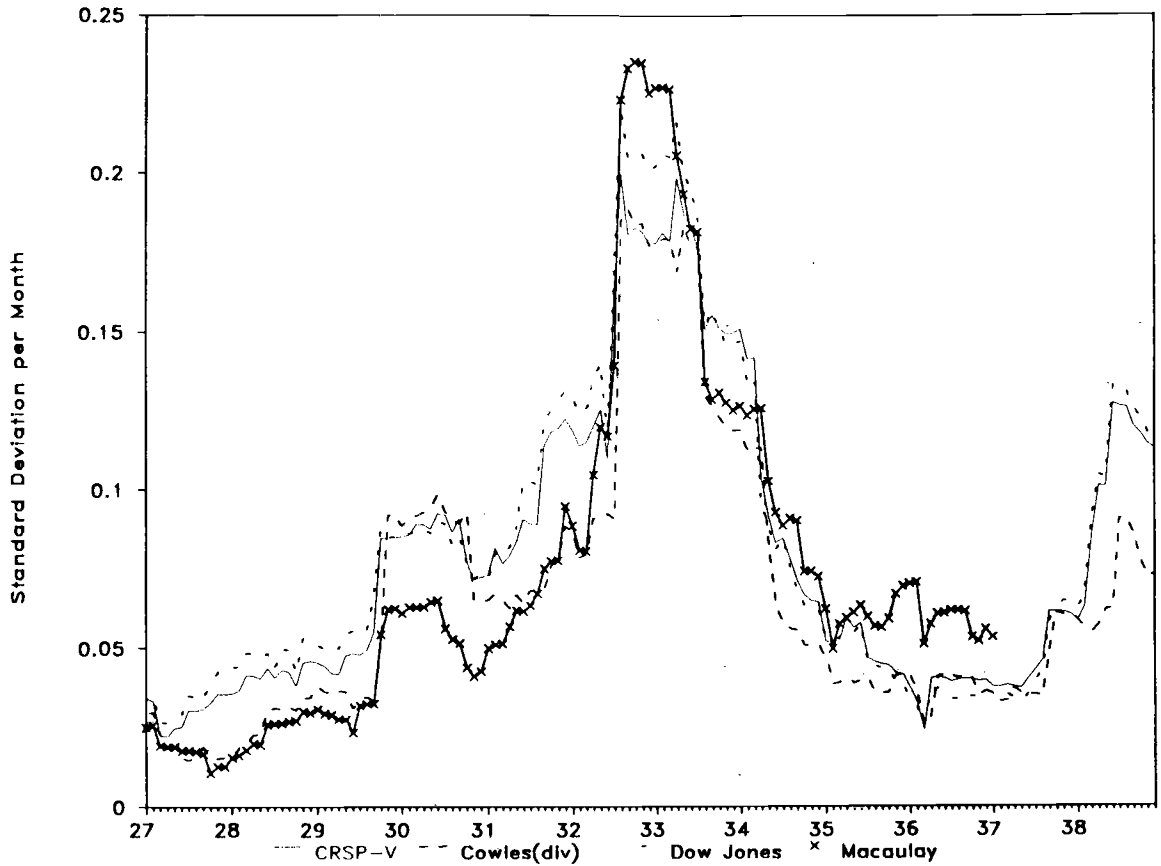

Figure 1 -- Estimates of the Monthly Standard Deviation of Returns for the CRSP Value-weighted, Cowles C-1, Dow Jones and Macaulay Portfolios Based on the Last 12 Monthly Returns, 1927-1938

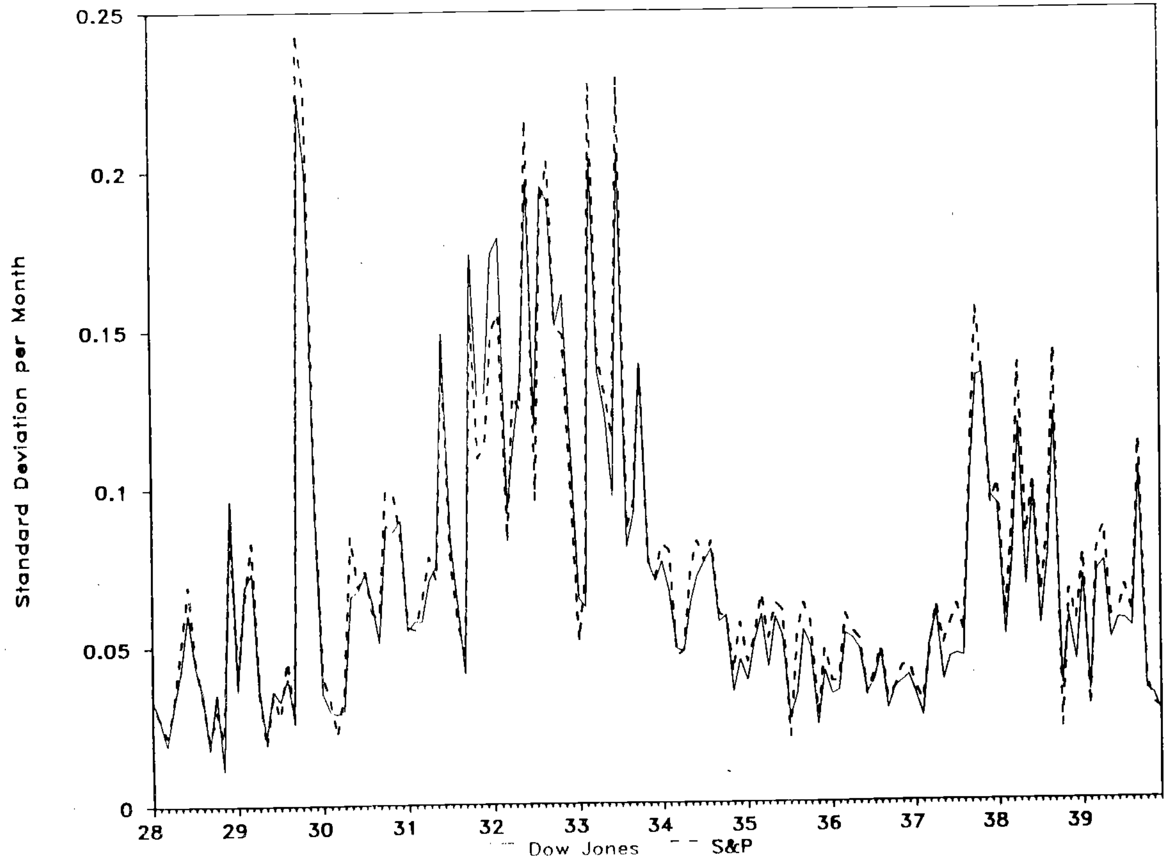

Figure 2 -- **Estimates of the Monthly Standard Deviation of Returns for the Dow Jones and Standard & Poor's Portfolios Based on the Daily Returns Within the Month, 1928-1939**

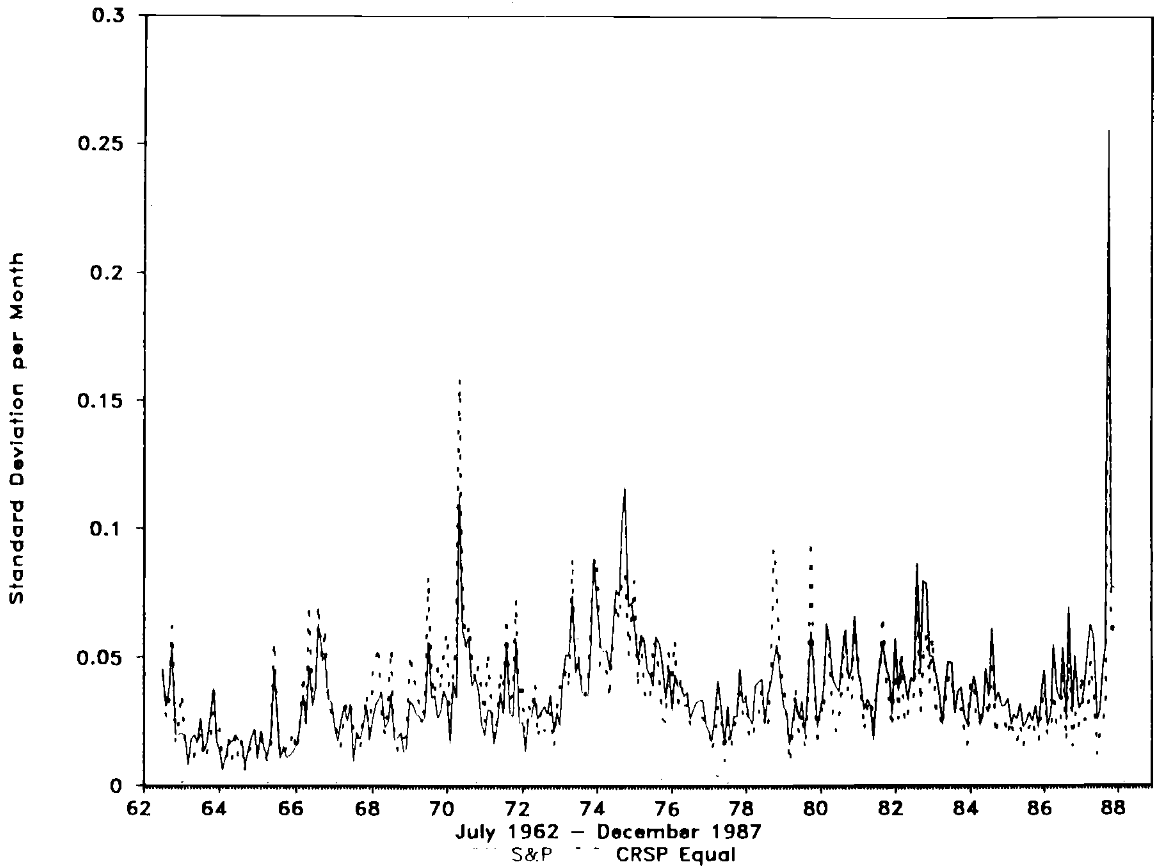

Figure 3 -- **Estimates of the Monthly Standard Deviation of Returns for the Standard & Poor's and CRSP Equal-weighted Portfolios Based on Daily Returns Within the Month, 1962-1987**

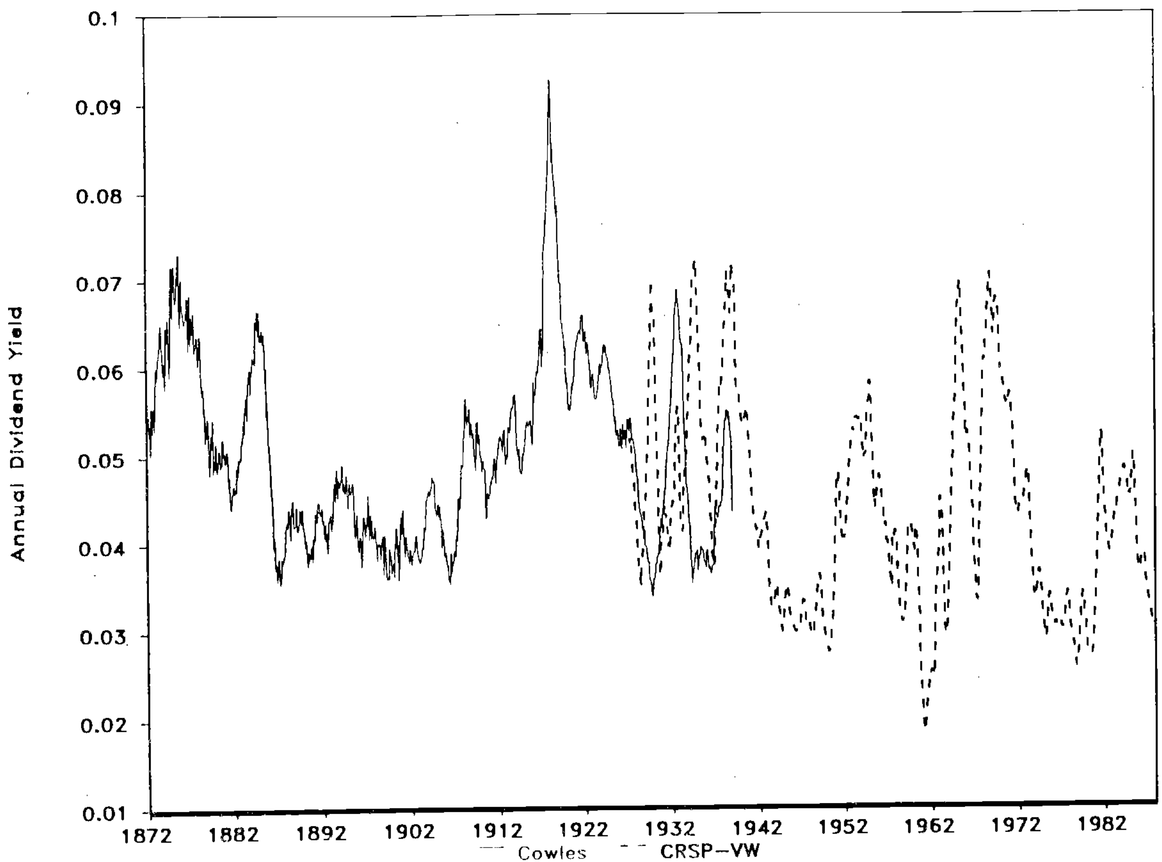

Figure 4 -- **Estimates of Annual Dividend Yields for the Cowles and CRSP Value-weighted Portfolios Based on the Last 12 Monthly Yields, 1871-1987**

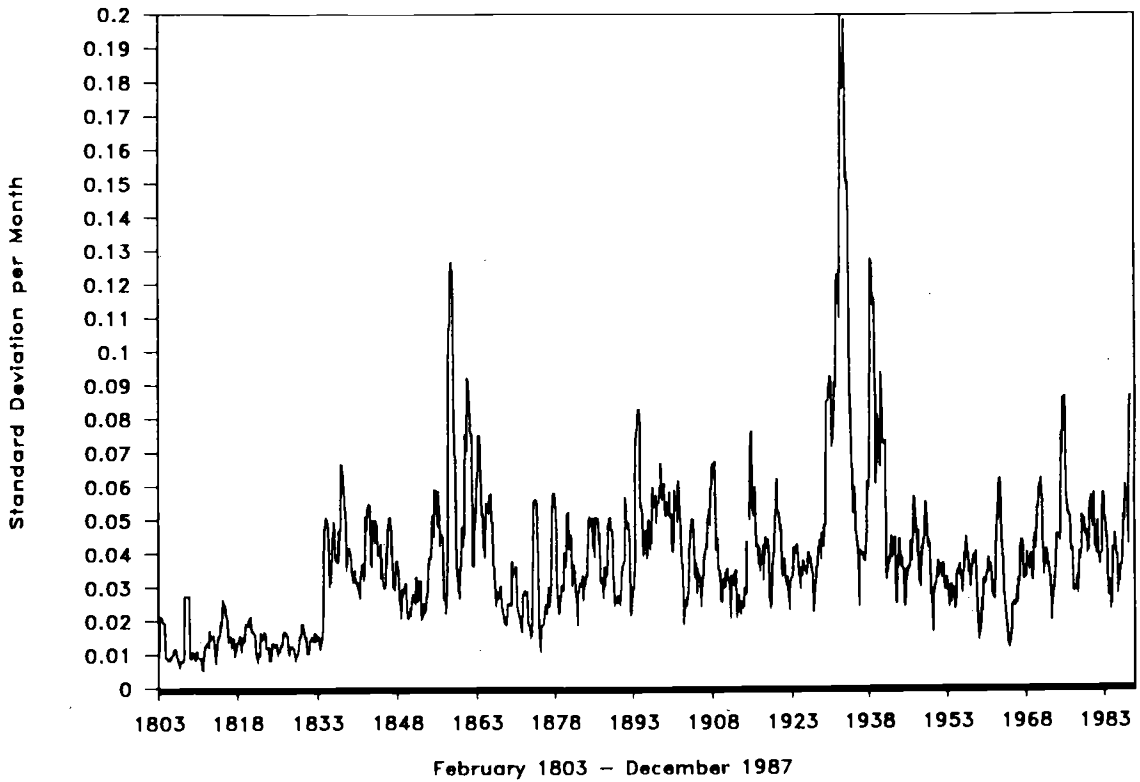

Figure 5 -- Estimates of Monthly Standard Deviation of Returns for the Combined Monthly Portfolio Based on the Last 12 Monthly Returns, 1803-1987

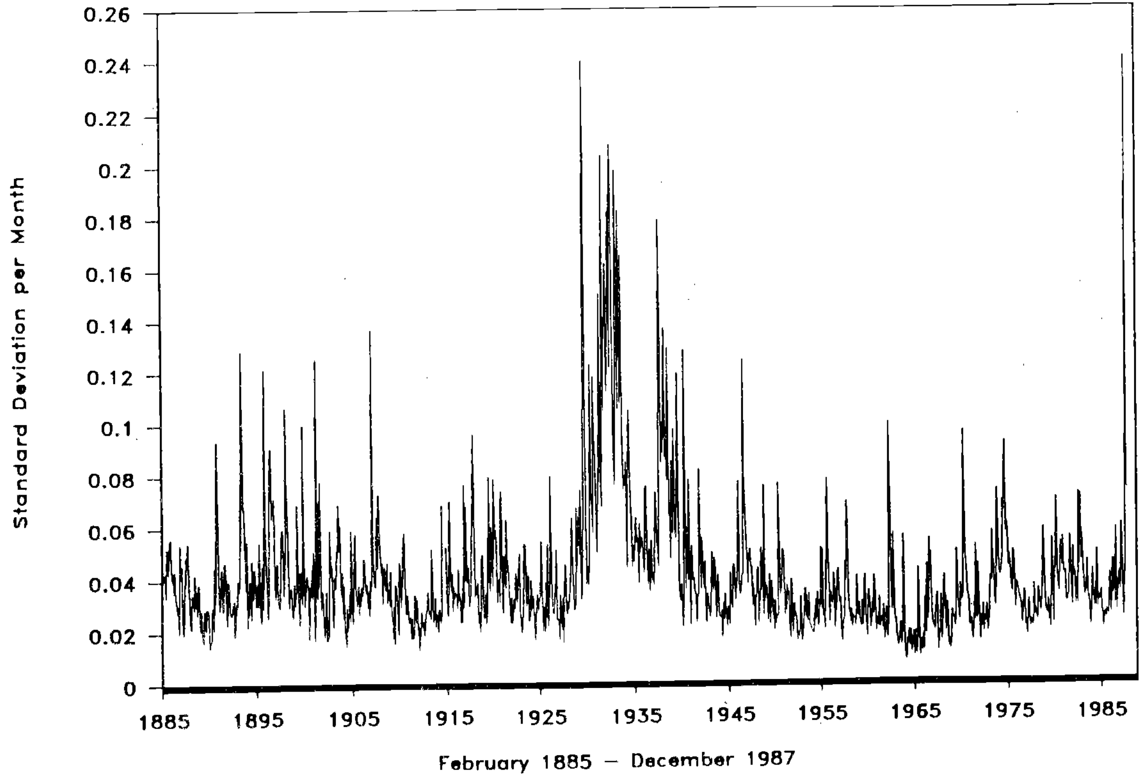

Figure 6 -- **Estimates of Monthly Standard Deviation of Returns for the Combined Daily Portfolio Based on the Daily Returns Within the Month, 1885-1987**

Appendix

Monthly Index of Common Stock Returns, 1802-1987

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1802	0.01000	0.01014	0.01018	0.01022	0.01036	0.01041	0.01046	0.01060	0.01075	0.01091	0.01116	0.01121
1803	0.01116	0.01098	0.01092	0.01086	0.01024	0.01040	0.01046	0.01049	0.01043	0.01059	0.01073	0.01068
1804	0.01062	0.01054	0.01058	0.01052	0.01055	0.01072	0.01066	0.01069	0.01062	0.01067	0.01082	0.01076
1805	0.01070	0.01073	0.01090	0.01083	0.01074	0.01067	0.01048	0.01052	0.01056	0.01049	0.01065	0.01083
1806	0.01076	0.01092	0.01109	0.01114	0.01117	0.01135	0.01154	0.01158	0.01176	0.01181	0.01185	0.01191
1807	0.01197	0.01188	0.01193	0.01185	0.01202	0.01221	0.01228	0.01245	0.01264	0.01270	0.01274	0.01308
1808	0.01204	0.01222	0.01227	0.01247	0.01265	0.01285	0.01292	0.01310	0.01329	0.01336	0.01340	0.01376
1809	0.01368	0.01373	0.01378	0.01385	0.01389	0.01426	0.01418	0.01423	0.01428	0.01435	0.01455	0.01463
1810	0.01455	0.01459	0.01434	0.01457	0.01461	0.01484	0.01492	0.01497	0.01503	0.01510	0.01514	0.01507
1811	0.01498	0.01503	0.01509	0.01516	0.01538	0.01545	0.01520	0.01492	0.01498	0.01455	0.01459	0.01467
1812	0.01458	0.01463	0.01486	0.01476	0.01481	0.01487	0.01461	0.01465	0.01524	0.01531	0.01571	0.01597
1813	0.01605	0.01628	0.01635	0.01624	0.01648	0.01637	0.01646	0.01651	0.01658	0.01666	0.01671	0.01699
1814	0.01651	0.01656	0.01682	0.01633	0.01638	0.01666	0.01655	0.01641	0.01589	0.01558	0.01504	0.01492
1815	0.01520	0.01566	0.01642	0.01623	0.01610	0.01626	0.01645	0.01658	0.01655	0.01671	0.01613	0.01613
1816	0.01612	0.01627	0.01643	0.01602	0.01601	0.01609	0.01571	0.01567	0.01573	0.01590	0.01604	0.01633
1817	0.01640	0.01647	0.01690	0.01709	0.01716	0.01762	0.01771	0.01826	0.01885	0.01933	0.01929	0.01920
1818	0.01949	0.01946	0.01984	0.01972	0.01969	0.02018	0.02008	0.02026	0.02034	0.02032	0.01967	0.01956
1819	0.01976	0.01973	0.01981	0.01969	0.01901	0.01888	0.01822	0.01871	0.01880	0.01855	0.01883	0.01905
1820	0.01926	0.01966	0.01940	0.01970	0.01943	0.02020	0.01995	0.02024	0.02077	0.02087	0.02080	0.02102
1821	0.02113	0.02141	0.02193	0.02224	0.02232	0.02286	0.02319	0.02327	0.02336	0.02347	0.02376	0.02344
1822	0.02356	0.02387	0.02419	0.02385	0.02301	0.02312	0.02302	0.02286	0.02319	0.02330	0.02314	0.02350
1823	0.02291	0.02322	0.02308	0.02319	0.02326	0.02337	0.02350	0.02382	0.02416	0.02452	0.02434	0.02472
1824	0.02484	0.02543	0.02578	0.02590	0.02623	0.02686	0.02624	0.02658	0.02694	0.02733	0.02741	0.02730
1825	0.02770	0.02779	0.02764	0.02803	0.02785	0.02799	0.02760	0.02769	0.02726	0.02767	0.02748	0.02708
1826	0.02722	0.02731	0.02798	0.02811	0.02792	0.02833	0.02735	0.02744	0.02726	0.02797	0.02806	0.02850
1827	0.02835	0.02844	0.02885	0.02869	0.02878	0.02921	0.02907	0.02917	0.02989	0.03003	0.02951	0.02906
1828	0.02891	0.02901	0.02944	0.02957	0.02967	0.02981	0.02965	0.02943	0.02987	0.03002	0.03011	0.03059
1829	0.03010	0.03052	0.03065	0.03046	0.03023	0.02972	0.02989	0.03098	0.03110	0.03091	0.03134	0.03184
1830	0.03336	0.03313	0.03326	0.03374	0.03351	0.03401	0.03454	0.03465	0.03513	0.03565	0.03541	0.03595
1831	0.03578	0.03661	0.03711	0.03692	0.03740	0.03830	0.03923	0.03862	0.03841	0.03896	0.03834	0.03892
1832	0.03911	0.03962	0.03978	0.04034	0.03971	0.04104	0.04087	0.04100	0.04117	0.04253	0.04305	0.04288
1833	0.04270	0.04245	0.04302	0.04362	0.04416	0.04437	0.04419	0.04474	0.04411	0.04555	0.04446	0.04470
1834	0.04325	0.04103	0.04207	0.04776	0.04834	0.04677	0.04630	0.04896	0.04910	0.05047	0.05210	0.05340
1835	0.05564	0.05491	0.05866	0.06063	0.06619	0.06592	0.06534	0.06679	0.06396	0.06287	0.05897	0.05799
1836	0.05883	0.06406	0.06409	0.06209	0.06205	0.06212	0.06003	0.05824	0.05658	0.05341	0.05183	0.05382
1837	0.05826	0.05835	0.05434	0.04972	0.04684	0.04565	0.05209	0.05114	0.05146	0.05279	0.05340	0.05226
1838	0.05127	0.04963	0.04781	0.04732	0.05029	0.05377	0.05342	0.05628	0.05735	0.05427	0.05452	0.05349
1839	0.05593	0.05813	0.05594	0.05663	0.05827	0.05688	0.05492	0.05350	0.05247	0.05022	0.04808	0.04962
1840	0.05199	0.05148	0.05003	0.05157	0.05162	0.05209	0.05247	0.05178	0.05347	0.05679	0.05636	0.05519
1841	0.05410	0.05378	0.04993	0.05168	0.05424	0.05452	0.05543	0.05483	0.05302	0.05202	0.05286	0.05059
1842	0.04359	0.04265	0.04099	0.04155	0.04478	0.04675	0.04512	0.04391	0.04518	0.04456	0.04301	0.04324
1843	0.04233	0.04418	0.04436	0.04480	0.05091	0.05418	0.05388	0.05587	0.05664	0.05647	0.05957	0.06681
1844	0.06614	0.06876	0.06988	0.07481	0.08000	0.08053	0.07905	0.08173	0.08280	0.08492	0.08251	0.08163
1845	0.07859	0.08431	0.08446	0.08408	0.08533	0.08316	0.08342	0.08248	0.08360	0.08604	0.08975	0.09304
1846	0.08483	0.08799	0.09126	0.08292	0.08317	0.08851	0.08605	0.08731	0.08565	0.08506	0.08530	0.08376
1847	0.08419	0.08959	0.08892	0.09035	0.09269	0.09937	0.10094	0.10229	0.10056	0.09681	0.09179	0.08911
1848	0.08854	0.09210	0.09357	0.09182	0.08993	0.09035	0.08866	0.08785	0.08819	0.08529	0.08445	0.09051
1849	0.09100	0.09128	0.09504	0.09319	0.09579	0.09853	0.09790	0.09471	0.09508	0.09438	0.09469	0.09519
1850	0.09569	0.09480	0.09878	0.09804	0.10197	0.10185	0.10175	0.10328	0.10490	0.11159	0.11315	0.11869

Appendix (continued)

Monthly Index of Common Stock Returns, 1802-1987

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1851	0.11800	0.11963	0.11884	0.12191	0.12106	0.12289	0.11970	0.11238	0.11412	0.11602	0.11900	0.12090
1852	0.11758	0.11795	0.12505	0.12828	0.13134	0.13192	0.13395	0.13705	0.13894	0.14098	0.14548	0.15172
1853	0.14560	0.14465	0.14385	0.14315	0.14785	0.14715	0.14652	0.13990	0.13758	0.13686	0.12870	0.13948
1854	0.13734	0.13783	0.14418	0.14195	0.13799	0.13863	0.12747	0.11895	0.11198	0.11709	0.11292	0.10291
1855	0.10344	0.11460	0.11820	0.11869	0.11902	0.12114	0.12650	0.12536	0.12422	0.12003	0.10606	0.10983
1856	0.11045	0.11088	0.11783	0.11998	0.11872	0.11597	0.11823	0.11862	0.11410	0.11465	0.11501	0.12071
1857	0.12134	0.12172	0.12222	0.11763	0.11798	0.10997	0.10195	0.10747	0.09209	0.06965	0.07521	0.08817
1858	0.08877	0.09439	0.11099	0.10060	0.10630	0.10309	0.09819	0.10400	0.10260	0.10126	0.10529	0.10586
1859	0.10642	0.10296	0.10339	0.09813	0.09654	0.09124	0.09177	0.09403	0.09637	0.09489	0.09319	0.09960
1860	0.09612	0.09643	0.10082	0.11135	0.11974	0.12431	0.12488	0.13752	0.14422	0.15304	0.13688	0.11898
1861	0.12167	0.13062	0.13119	0.13385	0.10669	0.10721	0.10782	0.11039	0.11087	0.11356	0.12694	0.12323
1862	0.12603	0.13078	0.13795	0.13853	0.14343	0.15074	0.15820	0.15416	0.16608	0.19171	0.20597	0.20010
1863	0.23156	0.23121	0.22739	0.23308	0.26005	0.24185	0.25586	0.27505	0.27047	0.28257	0.28074	0.27994
1864	0.29691	0.31063	0.33524	0.33639	0.31903	0.33358	0.32729	0.33388	0.30901	0.29330	0.31871	0.30892
1865	0.29559	0.29227	0.26087	0.26657	0.27361	0.26655	0.28495	0.27614	0.29447	0.30074	0.30344	0.29884
1866	0.28508	0.28163	0.28545	0.29196	0.29885	0.30329	0.31053	0.32464	0.32351	0.33814	0.32857	0.32531
1867	0.31275	0.31453	0.31301	0.30680	0.31469	0.32769	0.34051	0.33990	0.34106	0.34178	0.34185	0.35034
1868	0.36601	0.37328	0.37046	0.37067	0.38847	0.39286	0.39429	0.39064	0.39801	0.40556	0.39074	0.40749
1869	0.42348	0.42441	0.42228	0.43450	0.45643	0.45723	0.45875	0.46842	0.42960	0.43909	0.43409	0.42955
1870	0.44185	0.45783	0.45159	0.46504	0.48578	0.48652	0.47092	0.46719	0.47598	0.47876	0.48014	0.47598
1871	0.48189	0.49162	0.50619	0.52343	0.53834	0.53004	0.52546	0.53552	0.54161	0.50973	0.52880	0.54241
1872	0.55842	0.55899	0.58175	0.60004	0.59875	0.59399	0.59379	0.58927	0.58140	0.59205	0.59079	0.61056
1873	0.61718	0.62690	0.61870	0.61327	0.62245	0.61289	0.61823	0.62173	0.56355	0.52388	0.51393	0.57975
1874	0.60316	0.62084	0.60666	0.59642	0.58705	0.58877	0.59365	0.59746	0.60950	0.61164	0.62153	0.62068
1875	0.62590	0.62738	0.63861	0.65188	0.62199	0.61687	0.62784	0.63218	0.62464	0.62398	0.63893	0.63604
1876	0.66323	0.67096	0.66839	0.64242	0.62418	0.62855	0.62521	0.59653	0.56383	0.57297	0.56093	0.56422
1877	0.56344	0.52442	0.50479	0.46963	0.48252	0.43880	0.47715	0.50847	0.54077	0.55064	0.54008	0.54332
1878	0.54739	0.53705	0.55436	0.57230	0.57096	0.59114	0.60325	0.59273	0.61578	0.60351	0.60833	0.60382
1879	0.64193	0.66126	0.64516	0.67748	0.71060	0.71302	0.73173	0.73817	0.77098	0.86962	0.89824	0.89218
1880	0.94478	0.95487	0.97418	0.94812	0.86781	0.89759	0.94751	0.98083	0.97121	1.01458	1.07319	1.11457
1881	1.19390	1.16650	1.19708	1.19138	1.26217	1.26337	1.21613	1.19930	1.22025	1.19776	1.21964	1.17863
1882	1.17564	1.14976	1.15954	1.16316	1.14949	1.15293	1.24258	1.26331	1.27719	1.24000	1.19254	1.22340
1883	1.21650	1.18982	1.22186	1.25372	1.22205	1.25609	1.22470	1.17142	1.21072	1.16716	1.20939	1.17208
1884	1.14999	1.20236	1.18461	1.13932	1.03796	0.98913	1.04499	1.11894	1.05218	1.03907	1.02318	1.03249
1885	1.00719	1.05773	1.02214	1.06362	1.03190	1.03913	1.14194	1.16751	1.17548	1.32353	1.36324	1.36485
1886	1.31299	1.33223	1.30055	1.26724	1.32776	1.35314	1.39550	1.37289	1.46017	1.49900	1.51187	1.47904
1887	1.42885	1.47114	1.50462	1.52137	1.54254	1.48356	1.38755	1.39998	1.40802	1.33747	1.40654	1.41314
1888	1.42283	1.39773	1.31406	1.44358	1.36947	1.37175	1.48122	1.51929	1.55232	1.51938	1.50002	1.54451
1889	1.56097	1.56342	1.51708	1.57078	1.64096	1.62909	1.60946	1.68419	1.71885	1.69304	1.67361	1.70908
1890	1.73779	1.68906	1.70319	1.79925	1.85569	1.82583	1.80956	1.79953	1.73139	1.65001	1.55345	1.52527
1891	1.59106	1.62573	1.62255	1.72663	1.65165	1.60191	1.56857	1.77870	1.80077	1.79991	1.80672	1.87387
1892	1.87736	1.94444	1.89115	1.91052	1.87964	1.88030	1.92318	1.87296	1.84408	1.89950	1.80736	1.82862
1893	1.87819	1.76342	1.77096	1.72038	1.57671	1.52539	1.25368	1.38942	1.46055	1.56246	1.59767	1.44685
1894	1.53657	1.54168	1.61799	1.59559	1.52969	1.50817	1.49789	1.63639	1.56414	1.50214	1.50037	1.50350
1895	1.49146	1.45276	1.56450	1.63513	1.73619	1.74402	1.84826	1.90428	1.86937	1.78933	1.75981	1.60617
1896	1.66906	1.69821	1.67457	1.73141	1.68953	1.58175	1.43548	1.42250	1.57042	1.65995	1.70120	1.66956
1897	1.75136	1.73929	1.64128	1.62881	1.67872	1.82823	1.96367	2.19768	2.11315	2.05975	2.03090	2.11568
1898	2.21521	2.07390	2.01624	2.00949	2.28839	2.26927	2.31815	2.47150	2.32729	2.37582	2.51603	2.65606
1899	2.88379	2.95772	3.14888	3.16586	2.85614	3.05070	3.14575	3.19835	3.06586	3.16591	3.18059	2.90596

Appendix (continued)

Monthly Index of Common Stock Returns, 1802-1987

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1900	2.93291	2.92117	3.05217	2.92369	2.89181	2.71555	2.79171	2.84490	2.75736	2.94945	3.31864	3.54937
1901	3.55930	3.58084	3.83246	4.23052	4.12815	4.31072	3.96483	4.11385	3.93072	3.98116	4.09641	4.12553
1902	4.12745	4.12240	4.23823	4.38852	4.33510	4.34613	4.53681	4.59794	4.53614	4.46678	4.29892	4.39551
1903	4.42617	4.35007	4.17302	4.15704	3.96749	3.95840	3.63649	3.73412	3.37587	3.47560	3.50289	3.73415
1904	3.73136	3.55291	3.71527	3.71053	3.66321	3.78659	3.95657	4.15234	4.32278	4.57661	4.92344	4.85345
1905	5.01471	5.18653	5.31803	5.05467	5.07880	5.25115	5.47061	5.57954	5.68372	5.75146	5.84528	6.05135
1906	6.22062	5.92772	6.09623	5.71569	5.93907	5.66039	5.98694	6.22980	6.28404	6.12102	6.32884	6.14434
1907	5.86050	5.73449	5.12640	5.35902	4.95843	5.17497	5.17658	4.80595	4.75056	4.08535	4.21427	4.30162
1908	4.52817	4.29716	4.66037	4.90126	5.06230	5.10953	5.55113	5.74149	5.55841	5.76241	6.15881	6.27074
1909	6.14321	6.09280	6.40383	6.54774	6.72623	6.81732	7.14974	7.17271	7.29303	7.20973	7.01893	7.28318
1910	6.85729	6.88727	6.81713	6.62415	6.69289	6.28726	6.11829	6.32668	6.45551	6.69559	6.50799	6.54395
1911	6.85207	6.81577	6.82010	6.88355	7.03596	7.17809	7.23601	6.66181	6.54600	6.70748	6.96846	7.00065
1912	6.92857	7.01467	7.37802	7.56217	7.37925	7.54972	7.60236	7.74665	7.92412	7.70669	7.74601	7.52446
1913	7.39408	7.15167	7.24293	7.03051	7.02075	6.79783	7.04213	7.22493	7.21106	7.04731	6.94338	7.09633
1914	7.50328	7.32453	7.33303	7.09586	7.27256	7.25128	6.40257	New York Stock Exchange Closed for World War I				6.53305
1915	6.81847	6.59753	7.11439	7.85882	7.30491	7.63287	7.88019	8.28239	8.94451	9.67933	9.69912	9.83480
1916	9.13032	9.26247	9.43425	9.32254	9.68226	9.59974	9.53761	9.78565	10.6185	10.7570	10.7560	10.1306
1917	10.0837	9.67278	10.0767	9.84127	10.1044	10.0462	9.87142	9.25944	9.19407	8.38432	8.11373	8.49473
1918	8.95524	9.03812	8.85733	8.87716	9.18623	9.55039	9.49447	9.83255	9.94903	10.2088	9.91978	9.91982
1919	9.73197	10.1598	10.4414	10.8301	12.0033	11.8907	11.9494	11.5116	11.9567	12.4541	11.2584	11.5171
1920	11.3246	10.5715	11.4423	10.6717	10.6699	10.5036	10.4446	10.7425	10.8386	11.1130	10.2199	9.92627
1921	10.2806	10.0503	9.98950	10.2966	9.99888	9.66662	9.93290	9.74683	10.2297	10.3295	10.9185	11.1204
1922	11.2131	11.8374	12.3238	12.9252	13.2453	13.0741	13.7731	14.3468	13.8948	13.9073	13.4816	14.0182
1923	13.9959	14.7811	14.5978	14.1427	13.9685	12.8497	12.8685	13.6725	13.1783	13.3357	13.8664	14.2003
1924	14.7960	14.4703	14.2523	14.1063	14.1886	15.1072	16.0363	16.3658	16.2816	16.3617	17.6149	18.6828
1925	19.0898	19.1356	18.2232	18.7742	20.0168	20.0817	20.4603	21.4466	21.8065	23.2936	23.0964	24.2418
1926	24.2515	23.4747	21.9600	22.7713	23.1028	24.3830	25.0743	25.7710	25.8324	25.1175	25.8130	26.5675
1927	26.6132	27.8179	28.0056	28.1949	29.8151	29.2060	31.4047	32.2051	33.6974	32.3718	34.6188	35.4549
1928	35.3580	34.8786	37.9975	39.6326	40.3969	38.5438	38.9352	41.5689	42.8692	43.7658	49.0179	49.2443
1929	51.8683	51.8382	51.4667	52.3456	49.5037	54.3995	56.8433	61.6042	58.5851	47.1280	41.4517	42.1716
1930	44.5258	45.6924	49.1657	48.1704	47.5505	40.1029	41.7344	41.8812	36.7197	33.6918	32.7924	30.3268
1931	32.1978	35.6643	33.3967	30.1276	26.1305	29.7225	27.8375	27.8567	19.8356	21.4279	19.4957	16.8957
1932	16.7103	17.6962	15.7554	12.9392	10.3247	10.1835	13.5117	18.4018	17.8362	15.5367	14.7037	15.3707
1933	15.5214	13.4741	13.7002	18.8626	22.8419	25.8971	23.4259	26.2888	23.5178	21.5942	23.7751	24.2513
1934	27.3933	26.7502	26.9443	26.3979	24.5393	25.1928	22.4578	23.7895	23.7184	23.2724	25.2067	25.3535
1935	24.5509	24.0739	23.1844	25.2536	26.1334	27.5705	29.5715	30.3830	31.1044	33.2750	34.9889	36.5825
1936	38.9930	39.9915	40.3448	37.2215	39.0885	40.1033	42.6265	43.0921	43.7093	46.7343	48.3396	48.4052
1937	49.9940	50.6611	50.4410	46.6731	46.2738	44.4033	48.1392	45.9739	39.7893	36.0193	33.0321	31.6791
1938	31.9156	33.7507	25.8311	29.5403	28.3912	35.0604	37.5700	36.5627	36.8814	39.7277	39.0057	40.5689
1939	38.1490	39.4658	34.7861	34.6879	37.0684	35.1049	38.6545	36.1021	41.8618	41.6860	40.2295	41.4482
1940	40.4197	40.9784	41.7570	41.8110	32.6038	34.7679	35.8914	36.7307	37.5846	38.6953	38.0544	38.3204
1941	36.7740	36.2181	36.5755	34.6404	35.1370	37.1815	39.3598	39.3922	39.0984	37.0845	36.3672	34.6821
1942	34.8817	34.0875	31.8450	30.4746	32.3461	33.1611	34.3144	34.9585	35.8746	38.3082	38.3777	40.2702
1943	43.2915	45.8852	48.7025	49.0288	51.8181	52.6884	50.2635	50.9122	52.1394	51.4963	48.4984	51.5580
1944	52.4947	52.7137	53.9863	53.0532	55.8095	58.9738	58.0958	58.9802	58.9992	59.1626	60.0737	62.6030
1945	63.7443	67.9026	65.2542	70.3317	71.6276	71.9076	70.3076	74.5699	78.1455	81.2060	85.6388	86.6122
1946	91.9666	86.6714	91.8281	95.5579	99.5349	95.6466	93.1742	87.1971	78.4007	77.2973	77.4904	81.4098
1947	82.6395	81.6671	80.2894	76.4526	75.6775	79.7368	83.0390	81.5817	81.2163	83.2192	81.7121	84.1520
1948	81.0354	77.5045	83.9077	87.0721	93.5538	93.5524	88.8369	89.1774	86.5533	91.7253	83.4236	86.0981

Appendix (continued)

Monthly Index of Common Stock Returns, 1802-1987

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1949	86.3529	83.8750	87.3083	85.7322	83.3877	83.6743	88.1993	90.5374	93.4407	96.3895	98.2444	103.412
1950	105.100	106.625	107.921	112.254	117.086	110.466	112.228	117.879	123.632	123.459	127.045	134.310
1951	142.089	144.241	141.208	148.233	144.888	141.235	151.251	158.068	159.489	155.922	156.858	162.340
1952	165.105	161.006	168.318	160.117	165.331	171.841	173.887	172.673	169.355	168.464	178.394	183.970
1953	183.656	183.355	180.904	175.950	177.134	174.248	178.638	170.779	171.301	179.358	184.427	184.550
1954	193.884	197.608	205.073	213.814	220.521	223.028	234.270	228.994	243.721	239.791	262.800	277.329
1955	279.290	288.057	287.715	297.000	300.538	320.330	326.750	328.170	327.432	319.014	341.848	347.498
1956	337.754	351.113	375.037	376.924	358.202	371.582	390.542	379.228	360.294	362.871	365.545	376.659
1957	364.906	358.167	366.647	383.140	396.880	394.567	398.358	378.590	356.719	341.931	350.236	336.928
1958	353.809	348.859	360.542	371.513	380.662	391.881	409.529	417.195	437.756	449.572	463.233	487.897
1959	492.570	498.086	500.526	520.132	530.557	531.198	549.402	543.028	518.725	526.580	536.175	551.734
1960	514.622	521.034	514.721	506.754	523.619	535.730	524.606	540.365	508.967	506.641	530.923	556.468
1961	592.340	614.310	633.327	637.038	653.534	634.922	654.417	672.193	659.551	677.450	708.676	709.149
1962	683.436	696.449	692.523	649.083	594.220	545.110	581.129	594.419	564.656	567.015	630.418	638.653
1963	671.412	656.285	678.735	711.239	725.731	712.662	711.344	749.814	740.340	762.084	758.214	775.451
1964	795.532	809.582	823.887	827.443	841.426	855.092	871.984	862.042	888.355	896.819	899.033	902.483
1965	936.640	943.288	933.200	964.995	960.805	912.426	928.034	955.962	986.769	1015.17	1016.84	1029.37
1966	1039.72	1029.07	1007.14	1031.02	978.336	967.457	955.771	884.462	878.558	918.821	934.129	938.275
1967	1016.43	1026.52	1070.66	1115.58	1069.36	1094.56	1147.37	1140.44	1178.39	1145.38	1154.19	1189.95
1968	1143.66	1107.87	1115.41	1215.47	1243.87	1258.56	1231.31	1251.67	1303.92	1317.58	1393.19	1341.69
1969	1332.01	1265.07	1304.50	1332.25	1336.29	1252.98	1174.03	1232.93	1205.43	1271.77	1231.69	1209.94
1970	1117.58	1184.14	1180.96	1063.13	997.646	947.174	1017.84	1068.53	1114.03	1096.47	1154.15	1225.39
1971	1286.23	1305.20	1362.64	1408.91	1357.32	1363.13	1307.74	1363.03	1355.28	1301.58	1301.82	1419.70
1972	1453.65	1497.98	1511.79	1521.28	1547.50	1513.69	1510.83	1568.10	1557.83	1574.00	1651.92	1670.18
1973	1627.67	1562.23	1553.89	1481.87	1454.07	1441.67	1516.78	1470.88	1548.23	1546.08	1366.57	1387.37
1974	1386.59	1391.00	1357.35	1298.57	1253.09	1229.33	1139.88	1042.57	927.592	1083.43	1039.91	1015.47
1975	1152.39	1221.96	1257.40	1316.31	1388.70	1460.22	1367.37	1339.27	1290.98	1369.55	1412.39	1398.01
1976	1573.10	1574.65	1621.44	1603.61	1589.07	1664.53	1652.27	1653.14	1695.67	1659.58	1668.13	1764.98
1977	1694.99	1666.56	1648.57	1654.90	1634.41	1718.08	1691.48	1667.60	1668.27	1602.48	1670.32	1679.56
1978	1583.17	1563.90	1613.66	1748.36	1781.51	1757.94	1857.84	1927.61	1914.89	1719.16	1773.67	1802.97
1979	1888.09	1833.39	1947.04	1960.28	1931.12	2017.38	2048.28	2177.31	2176.51	2025.79	2148.53	2197.52
1980	2333.62	2325.59	2075.39	2176.67	2303.77	2380.84	2543.87	2594.81	2670.21	2722.68	3015.90	2914.30
1981	2787.45	2838.55	2960.52	2911.90	2935.59	2912.42	2914.60	2751.44	2598.18	2747.04	2872.98	2793.08
1982	2731.42	2596.92	2575.29	2683.16	2605.04	2553.25	2499.32	2812.25	2847.79	3177.24	3326.97	3380.72
1983	3505.64	3603.59	3724.08	3992.75	4007.66	4161.15	4034.69	4084.66	4156.10	4080.31	4184.89	4150.53
1984	4113.68	3961.97	4028.09	4049.27	3841.59	3930.92	3869.38	4300.59	4309.41	4323.67	4283.13	4390.93
1985	4740.01	4818.73	4816.95	4803.61	5085.68	5173.10	5154.96	5131.10	4942.96	5163.50	5518.95	5770.26
1986	5812.81	6241.48	6588.51	6501.42	6836.01	6939.20	6558.94	7038.50	6478.44	6828.43	6955.22	6769.03
1987	7637.02	7950.11	8146.43	8025.57	8077.25	8464.75	8861.03	9187.79	8996.24	7049.17	6517.17	6963.66